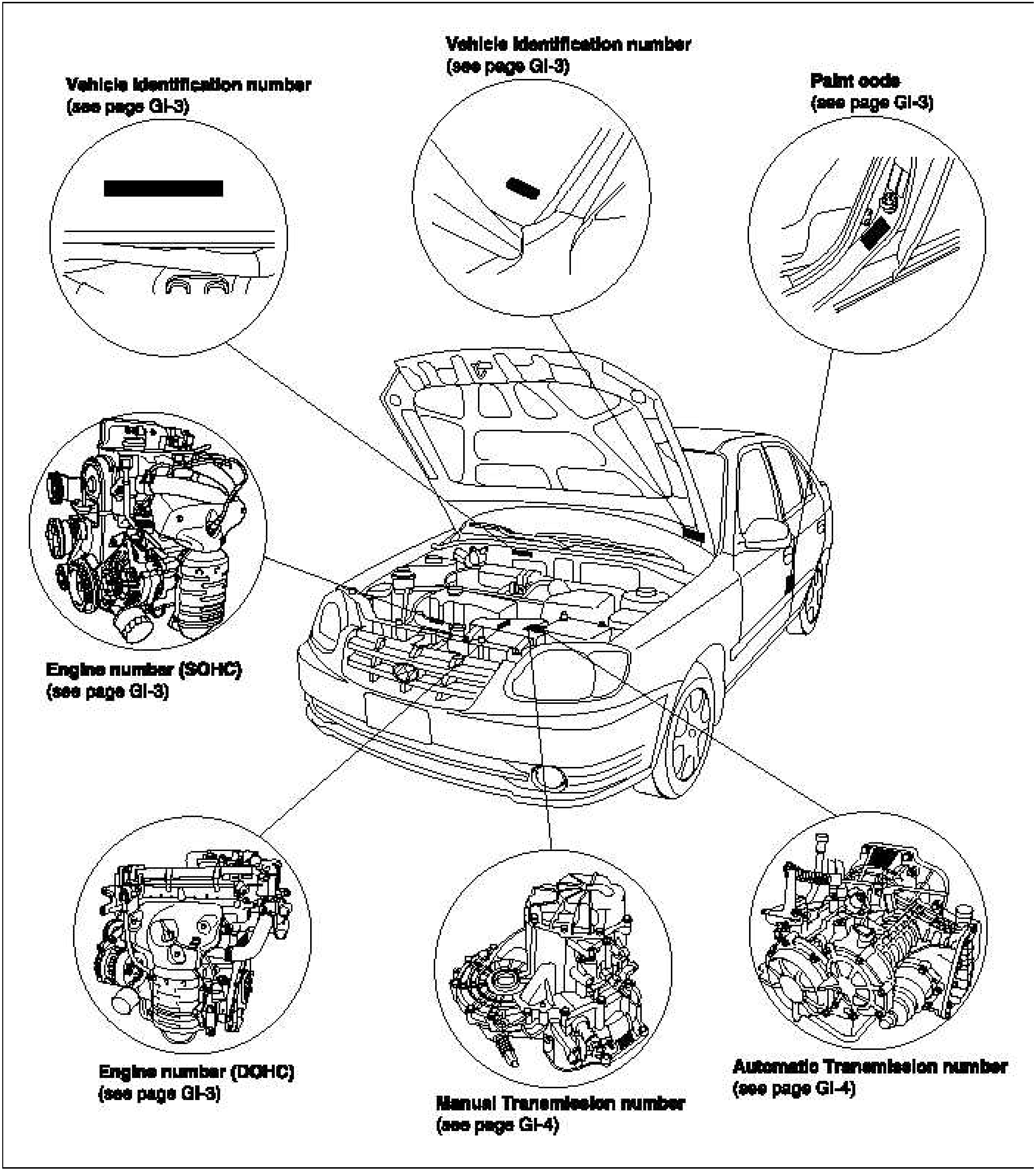
ACCENT(LC) > 2005 > G 1.5 SOHC > General Information

General Information > General Information > General Information

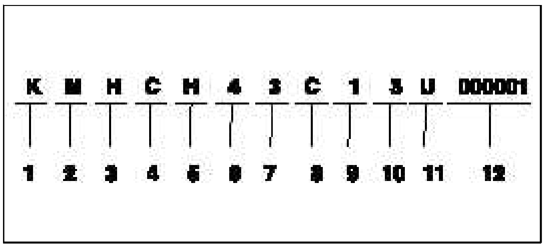
IDENTIFICATION NUMBER

VEHICLE IDENTIFICATION NUMBER LOCATION


Vehicle identification number
(see page GI-3)
Vehicle identification number
(see page GI-3)
Paint code
(see page GI-3)
Engine number (SOHC)
(see page GI-3)
Engine number (DOHC)
(see page GI-3)
Manual Transmission number
(see page GI-4)
Automatic Transmission number
(see page GI-4)

IDENTIFICATION NUMBER DESCRIPTION

VEHICLE IDENTIFICATION NUMBER



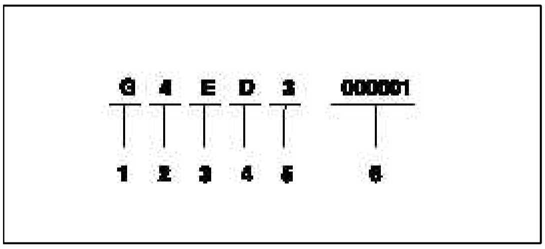
1. Geographic zone
   - K : Korea
2. Manufacturer
   - M : Hyundai motor company
3. Vehicle type
   - H : Passenger
4. Vehicle line
   - C : ACCENT
5. Model & Series
   - F : STANDAD (L)
   - G : DELUXE (GL)
   - H : SUPER DELUXE (GLS)
6. Body type
   - 3 : Sedan 3 - Door
   - 4 : Sedan 4 - Door
7. Restraint system
   - 3 : Drive side - Active belt and air bag
   Passenger side - Active belt or passive belt
   - 4 : Both side - Active belt and air bag
   - 5 : Depowered - Air bag
8. Engine type
   - C : Gas 1.6 DOHC
   - G : Gas 1.5 SOHC
9. Driver side
   - 1 ~ 9, X
10. Production year
    - 3: 2003, 4 : 2004, 5 : 2005, 6 : 2006
11. Plant of production
    - U : Ulsan (Korea)

12. Vehicle production sequence number
    - 000001 ~ 999999

PAINT CODE

CODE	COLOR
NW	Noble White
EB	Ebony Black
CS	Clean Silver
HL	Hiphop Red
YA	Potomac Blue
TI	Tundra Green
UA	Hof Gold
WS	Technical Gray
ZG	Mass Green
VS	Celadon Blue

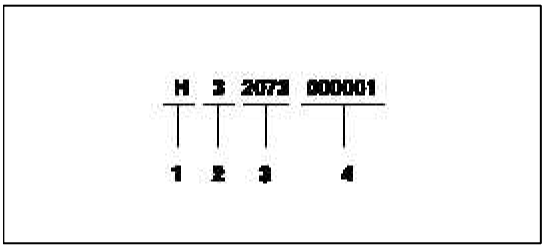
ENGINE IDENTIFICATION NUMBER



1. Engine fuel
   - G : Gasoline
2. Engine range
   - 4 : In line 4 cycle 4 cylinder
3. Engine development order
   - E : Alpha engine
4. Engine capacity
   - B : 1495 cc
   - D : 1599 cc
5. Production year
   - 3 : 2003, 4 : 2004, 5 : 2005, 6 : 2006
6. Engine production sequence number
   - 000001 ~ 999999

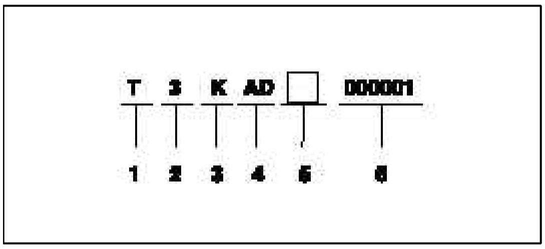
TRANSMISSION IDENTIFICATION NUMBER

MANUAL



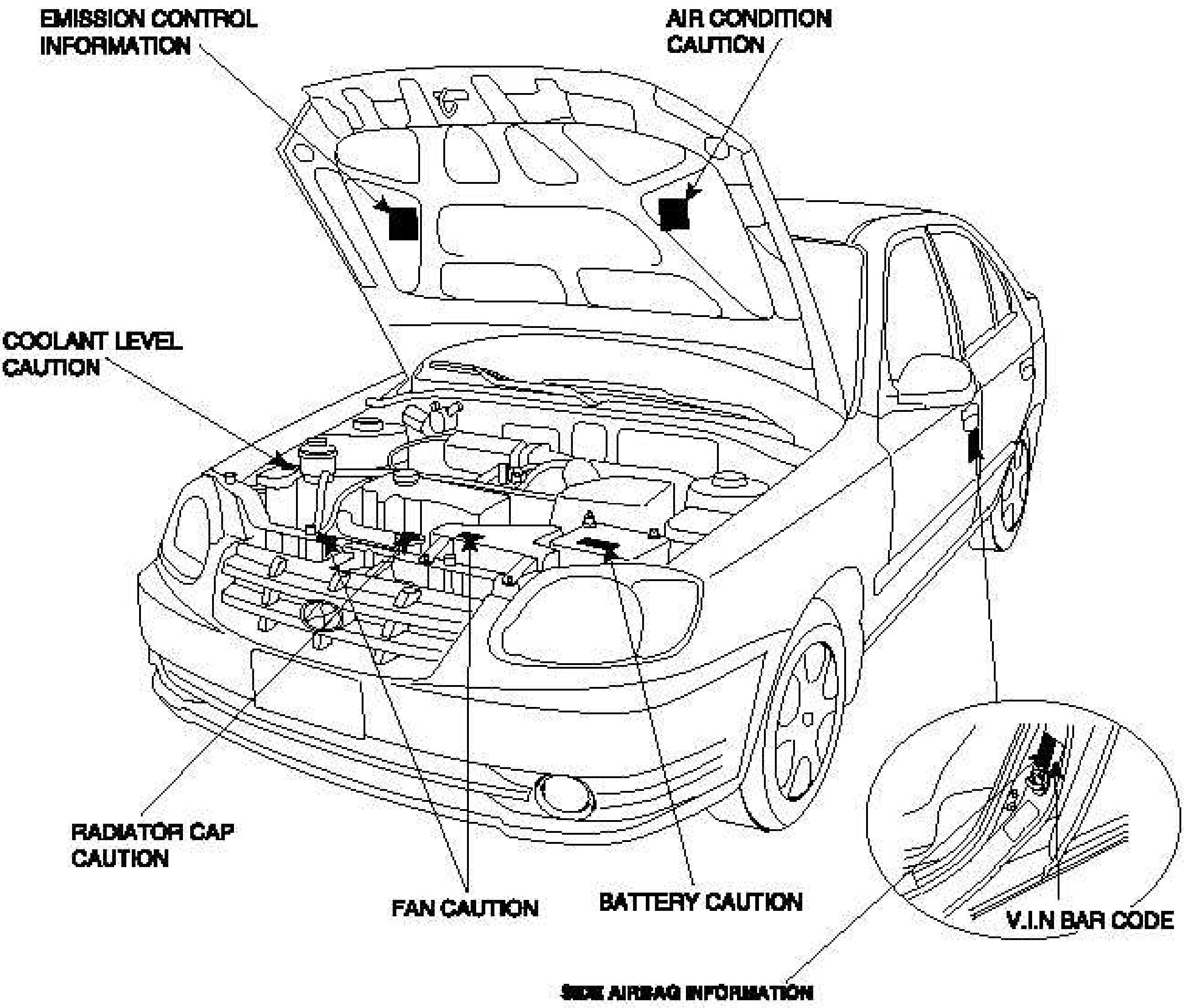
1. Model
   - H : M5AF3
2. Production year
   - 2 : 2002, 3 : 2003, 4 : 2004
   - 5 : 2005, 6 : 2006, 7 : 2007
3. Gear ratio
   - 2073 : 3.650
4. Transmission production sequence number
   - 000001 ~ 999999

AUTOMATIC



1. Model
   - T : A4AF3
2. Production year
   - 2 : 2002, 3 : 2003, 4 : 2004
   - 5 : 2005, 6 : 2006, 7 : 2007
3. Gear ratio
   - K : 3.443
   - L : 3.656
   - N : 4.041
4. Detailad classification
   - AD : 1.5 DOHC
   - ID : 1.6 DOHC
5. Spare
6. Transmission production sequence number
   - 000000 ~ 999999

WARNING / CAUTION LABEL LOCATIONS


EMISSION CONTROL INFORMATION
AIR CONDITION CAUTION
COOLANT LEVEL CAUTION
RADIATOR CAP CAUTION
FAN CAUTION
BATTERY CAUTION
V.I.N BAR CODE
SIDE AIRBAG INFORMATION

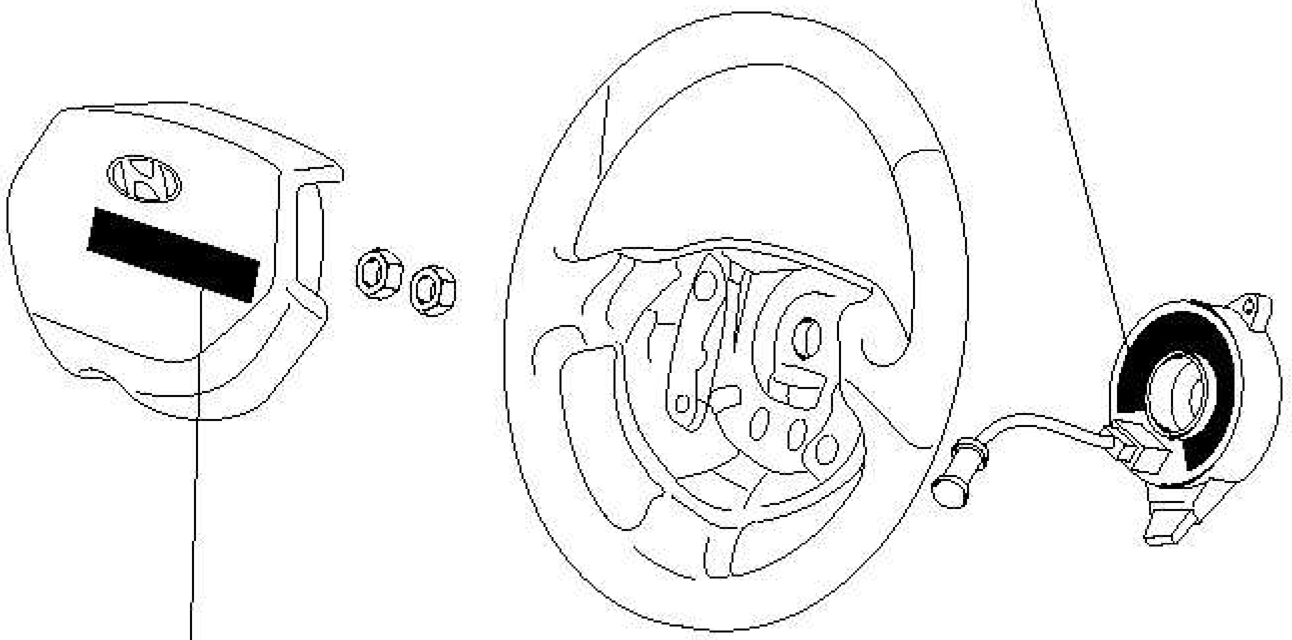
ATTENTION

SRS VEHICLE
THIS CAR IS EQUIPPED WITH A SUPPLEMENTAL
RESTRAINT SYSTEM. TO PROVIDE CONTINED RELIABLITY,
CERTAIN ELEMENTS OF THE SUPPLEMENTAL RESTRAINT
SYSTEM SHALL BE SERVICED OR REPLACED BY AUTHORIZED
DEALER TEN YEARS AFTER VEHICLE LABEL. FOR FURTHER INFORMATION.
SEE OWNER'S MANUAL.

SIDE AIR BAG
THIS CAR IS EQUIPPED WITH A SIDE AIRBAG SYSTEM.
TO PROVIDE CONTINUED RELIABILITY, CERTAIN ELEMENTS
OF THE SIDE AIRBAG SYSTEM SHALL BE SERVICED OR
VEHICLE MANUFACTURE DATE SHOWN ON CERTIFICATION LABEL.
FOR FURTHER INFORMATION
SEE OWNER'S MANUAL.

AIR BAG WARNING / CAUTION LABEL

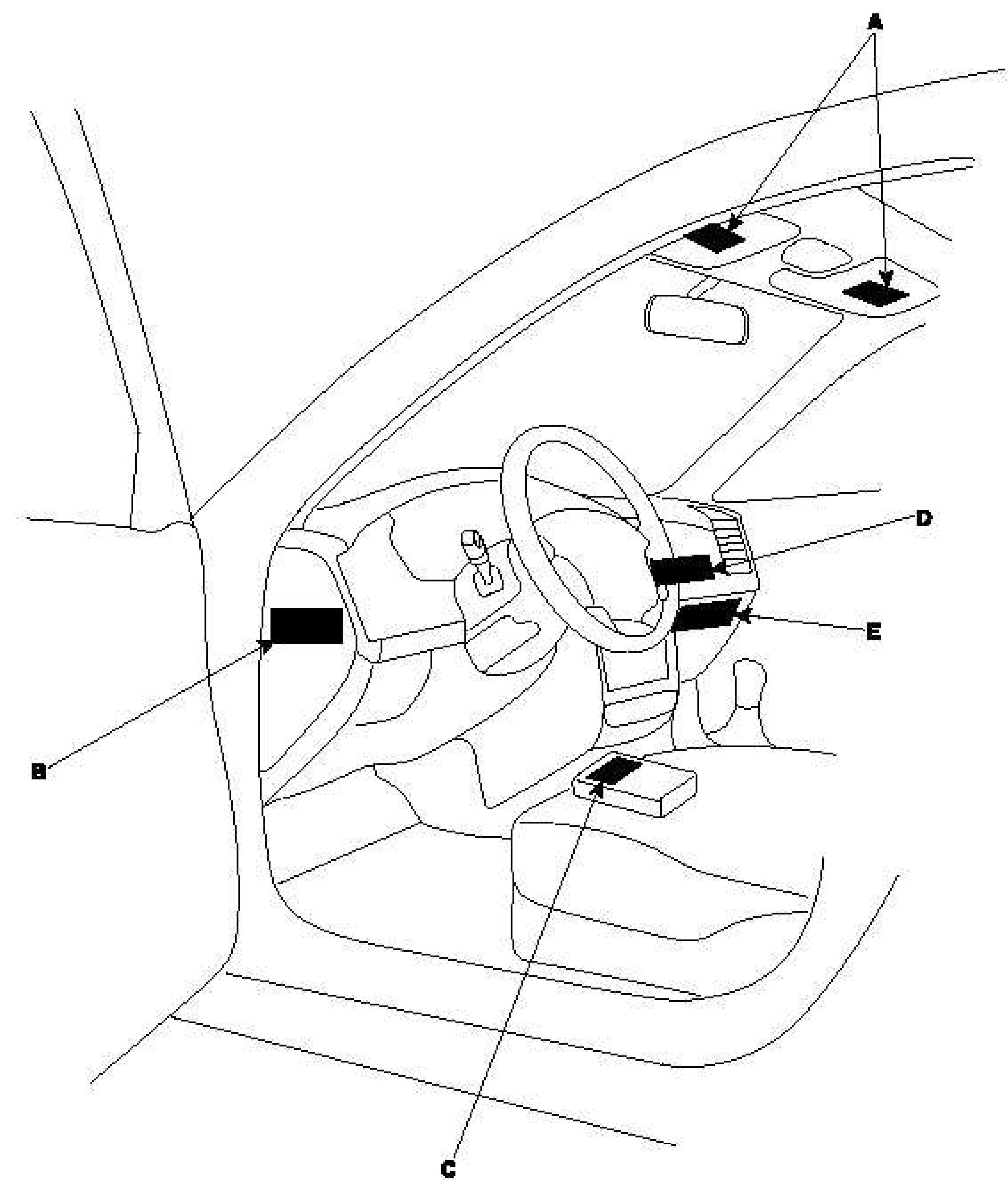
CAUTION
AIRBAG : Handing is limited to trained personnel.
To be used only in prescribed vehicles. If not propely installed, device may become a dangerous projectile.
See serivce manual instruction



DRIVE MODULE CAUTION

Caution
Don't open, remove or transfer to another vehicle. Risk of malfunction and bodily injury!
This unit is to be installed and/or dismantled by trained personnel only. This item contains an explosive to be installed igniter.

AIR BAG WARNING / CAUTION LABEL (CONT'D)



WARNING / CAUTION LABEL (CON'T)

A : SRS INFORMATION

WARNING

Death or serious injury can occur.

- Children 12 and under can occur.
- The back seat is the safest place for children.
- Never put a rear-facing child seat in the front.
- Sit as far back as possible from the airbag.
- Alway use seat belts and child restraints.

B : WARNING
SEE OWNER'S MANUAL
This car is equipped a side airbag for each front seat.

- Do not use any accessory seat covers.
- Use of other seat covers could reduce the effect of the system.
- Do not install any accessories on the side or rear the side airbag.
- Do not use excessive force on the side of the seal.
- For further information, see the owner's manual.

C : CAUTION
AIRBAG ESPE UNIT

Detach connector before unmounting. Assemble strictly according to manual instructions.

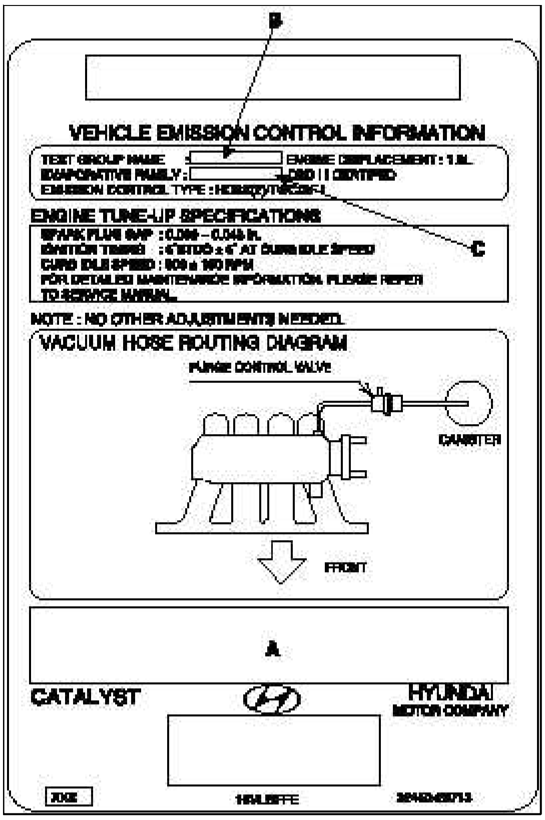
D : PASSENGER MODULE CAUTION

CAUTION
Don't open, remove or transfer to another vehicle.
Risk of malfunction and bodily injury!
This unit is to be installed and/or dismantled by trained personnel only. This item contains an explosive to be installed igniter.

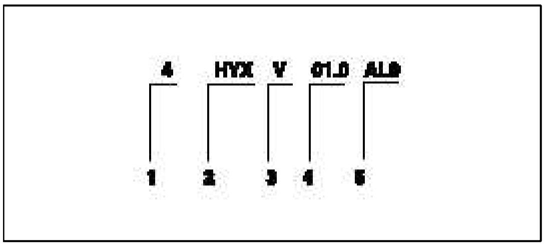
E : SUPPLEMENTAL RESTRAINT SYSTEM
(AIRBAG) INFORMATION

- The airbag is a Supplement Restraint System (SRS).
  You must always wear the seat belts.
- The airbag system condition is normal when the "SRS" lamp in the cluster flashes approximately 6 times after the ignition key is turned on and then goes off.
- If any of the following condition occur, the system must be serviced.
  - "SRS" lamp dose not light up when the key is turned on.
  - "SRS" lamp stays lit or flashes continuously.
  - The airbag has inflated.
- The airbag system must be inspected by an authorized dealer ten years after the vehicle manufacture date shown on the certification label, located on left front door opening area.
- WARNING
  Failure to the above instructions may result injury to you or other occupants in the vehicle.
- See the "SRS" section in owner's Manual for more information about airbags.

EMISSION CONTROL LABEL
Emission Grop Identification
EXAMPLE :

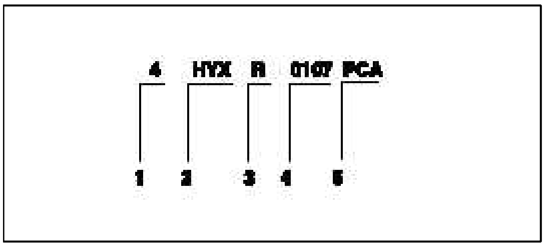

B
VEHICLE EMISSION CONTROL INFORMATION
TEST GROUP NAME :
ENGINE DISPLACEMENT : 1.6L
EVAPORATIVE FAMILY :
OBD I I CERTIFIED
EMISSION CONTROL TYPE :
C
ENGINE TUNE-UP SPECIFICATIONS
SPARK PLUG GAP : 0.039 – 0.043 in.
IGNITION TIMING : 5°BTDC ± 5° AT CURB IDLE SPEED
CURB IDLE SPEED : 800 ± 100 RPM
FOR DETAILED MAINTENANCE INFORMATION, PLEASE REFER TO SERVICE MANUAL.
NOTE : NO OTHER ADJUSTMENTS NEEDED.
VACUUM HOSE ROUTING DIAGRAM
PURGE CONTROL VALVE
CANISTER
FRONT
A
CATALYST
HYUNDAI
MOTOR COMPANY

B :


4
HYX
V
01.6
AL9
1
2
3
4
5

1. Model Year
    - 4 : 2004
2. Manufacturer Subcode
    - HYX : HYUNDAI MOTOR
3. Family Type
    - V : Passenger car
4. Displacement
5. Sequence Characters.

C :


4
HYX
R
0107
PCA
1
2
3
4
5

1. Model Year
    - 4 : 2004
2. Manufacturer Subcode
    - HYX : HYUNDAI MOTOR

3. Family Type
    - R : EVAP/ORVR
4. Canister Work Capacity
5. Sequence Characters

LIFT AND SUPPORT POINT

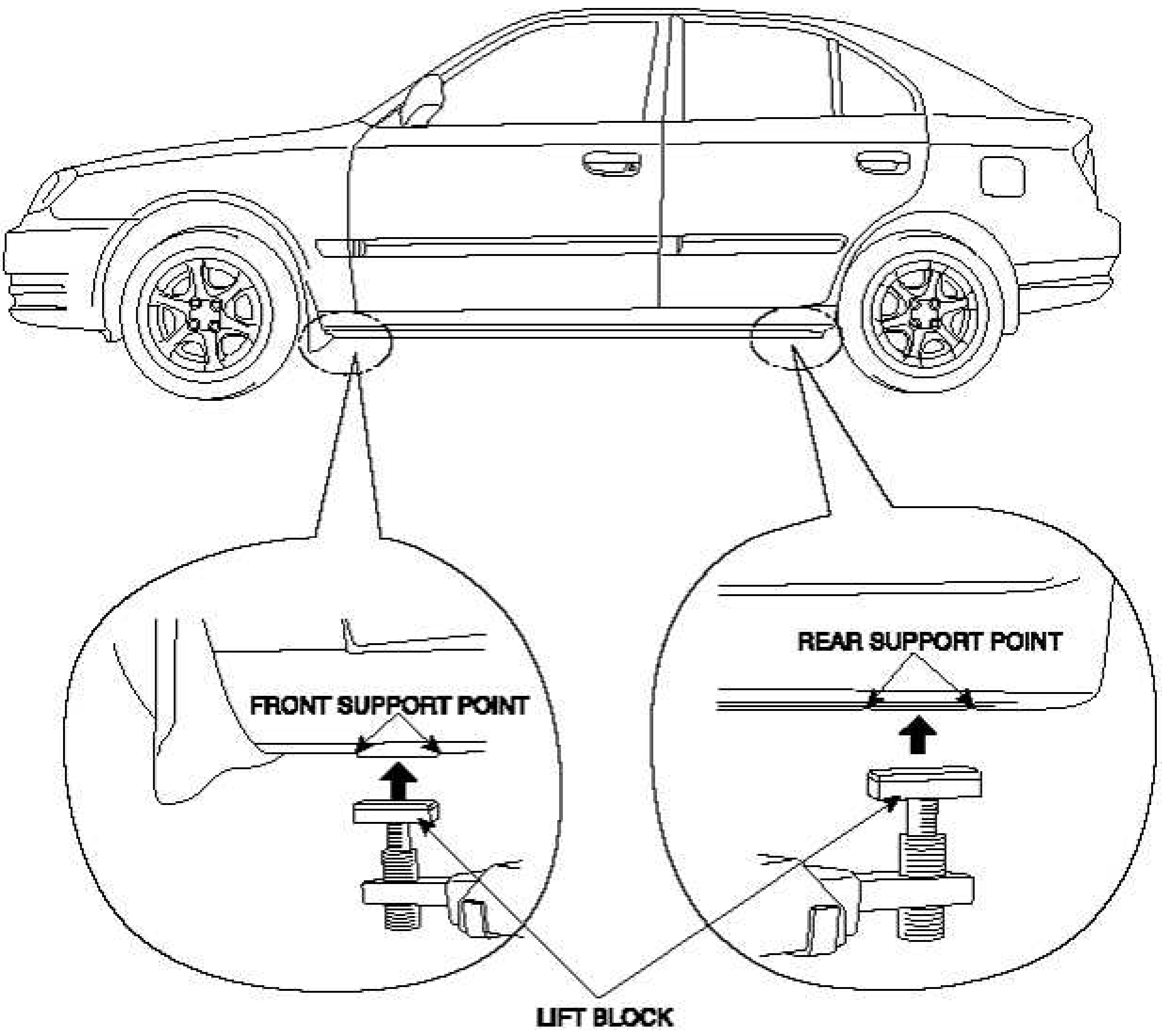
WARNING

When heavy rear components such as suspension, fuel tank, spare tire, tailgate and trunk lid are to be removed, place additional weight in the luggage area before hoisting . When substatial weight is removed from the rear of the vehicle the, center of gravity may change and cam cause the vehicle to tip forward on the hoist.

NOTE

- Since each tire/wheel assembly weights approximately 30lbs(14kg), placing the front wheels in the luggage area can assist with weight distribution.
- Use the same support points to support the vehicle on safely stands.

1. Place the lift blocks under the support points as shown in the illustration.
2. Raise the hoist a few inches (centimerers) and rock the vehicle to be sure it is firmly supported.
3. Raise the hoist to full height to inspect the lift points for secure support.



TOWING

If the vehicle needs to be towed, call a professional towing service. Never tow vehicle with just a rope or chain. It is very dangerous.

- The operator loads the vehicle on the back of truck. This is best way of transporting the vehicle.
- The tow truck uses two pivoting arms that go under the tires (front or rear) and lift them off the ground. The other two wheels remain on the ground.

If the vehicle cannot be transported by flat-bed, if should be towed with the front wheels off the ground. If due to damage, the vehicle must be toward with the front wheels on the ground, do not following :

Manual Transmission

- Release the parking brake.
- Shift the transmission to neutral.

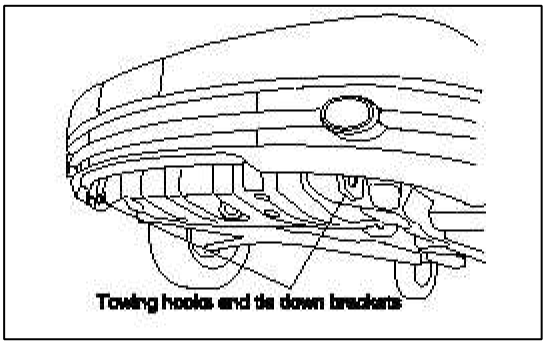
Automatic Transmission

- Release the parking brake.
- Start the engine.
- Shift to [D] position, then [N] position.
- Turn off the engine.

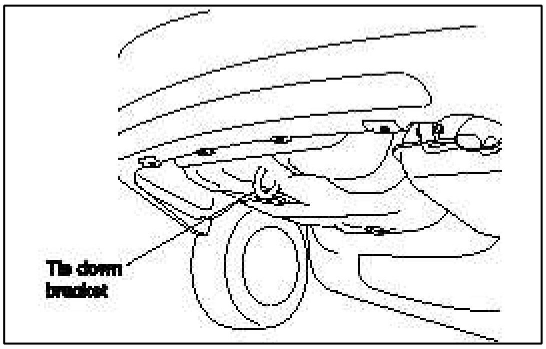
CAUTION

- Improper towing preparation will damage the transmission. Follow the above procedure exactly. Follow the above procedure exactly. If you cannot shift the transmission or start the engine (automatic transmission), your vehicle must be transported on a flat-bed.
- It is best to tow vehicle no farther than 19miles (30km), and keep the speed below 30mph (50km/h).
- Trying to lift or tow your vehicle by the bumpers will cause serious damage. The bumpers are not designed to support the vehicle's weight.

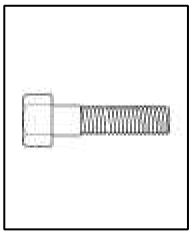
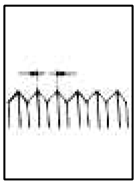
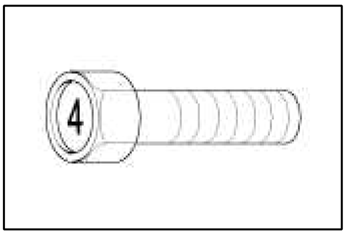
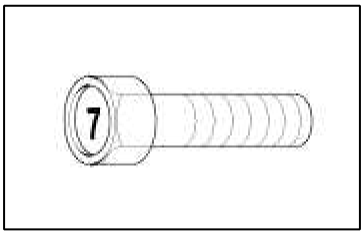
FRONT :



REAR :



TIGHTENING TORQUE TABLE OF STANDARD PARTS

Bolt nominal diameter (mm)	Pitch (mm)	Torque Nm (kg.cm, lb.ft)	
		Head Mark 4	Head Mark 7
			
M5	0.8	3 ~ 4 (30 ~ 40, 2.2 ~ 2.9)	5 ~ 6 (50 ~ 60, 3.6 ~ 4.3)
M6	1.0	5 ~ 6 (50 ~ 60, 3.6 ~ 4.3)	9 ~ 11 (90 ~ 110, 6.5 ~ 8.0)
M8	1.25	12 ~ 15 (120 ~ 150, 9 ~ 11)	20 ~ 25 (200 ~ 250, 14.5 ~ 18.0)
M10	1.25	25 ~ 30 (250 ~ 300, 18 ~ 22)	30 ~ 50 (300 ~ 500, 22 ~ 36)
M12	1.25	35 ~ 45 (350 ~ 450, 25 ~ 33)	60 ~ 80 (600 ~ 800, 43 ~ 58)
M14	1.5	75 ~ 85 (750 ~ 850, 54 ~ 61)	120 ~ 140 (1,200 ~ 1,400, 85 ~ 100)
M16	1.5	110 ~ 130 (1,100 ~ 1,300, 80 ~ 94)	180 ~ 210 (1,800 ~ 2,100, 130 ~ 150)
M18	1.5	160 ~ 180 (1,600 ~ 1,800, 116 ~ 130)	260 ~ 300 (2,600 ~ 3,000, 190 ~ 215)
M20	1.5	220 ~ 250 (2,200 ~ 2,500, 160 ~ 180)	360 ~ 420 (3,600 ~ 4,200, 260 ~ 300)
M22	1.5	290 ~ 330 (2,900 ~ 3,300, 210 ~ 240)	480 ~ 550 (4,800 ~ 5,500, 350 ~ 400)
M24	1.5	360 ~ 420 (3,600 ~ 4,200, 260 ~ 300)	610 ~ 700 (6,100 ~ 7,000, 440 ~ 505)

NOTE

1. The torques shown in the table are standard values under the following conditions :
    - Nuts and bolts are made of galvanized steel bar.
    - Galvanized plain steel washers are inserted.
    - All nuts, bolts, and plain washers are dry.
2. The torques shown in the table are not applicable :
    - When spring washers, toothed washers and the like are inserted.
    - If plastic parts are fastened.
    - If self - tapping screws or self - locking nuts are used.
    - If threads and surfaces are coated with oil.
3. If you reduce the torques in the table to the percentage inddcated below, under the following conditions, if will be the standard value.
    - If spring washers are used. : 85%
    - If threads and braring sufaces are stained with oil : 85%

LUBRICANTS

RECOMMENDED LUBRICANTS

Parts		OIL & GREASE STANDARD	
Engine oil		API SH, SG or ABOVE	Hot Climate : SAE 20W -40, 20W-50 (ABOVE 32°F For 0°C)
			Normal Climate : SAE 10W-30, 10W-40, 10W-50 (ABOVE -10°C For -23°C)
			Cold Climate : SAE 5W-30, 5W-30, 5W-40 (BELOW100° FoR 38°C)
Transaxle	Manual	HYUNDAI GENUINE PARTS MTF 75W/90 (API GL-4)	
	Auto	DIAMOND ATF SP-III, SK ATF SP-111	
Power Steering		PSF-3	
Brake Fluid		DOT 3, DOT 4 or equivalent	
Coolant		Ethylene glycol base for aluminium radiator.	
Transaxle linkage, parking brake cable mechanism, hood lock and hook, door latch, seat adjust, tailgate latch, door hinges, tailgate hinges		Multipurpose grease NLGI grade #2	

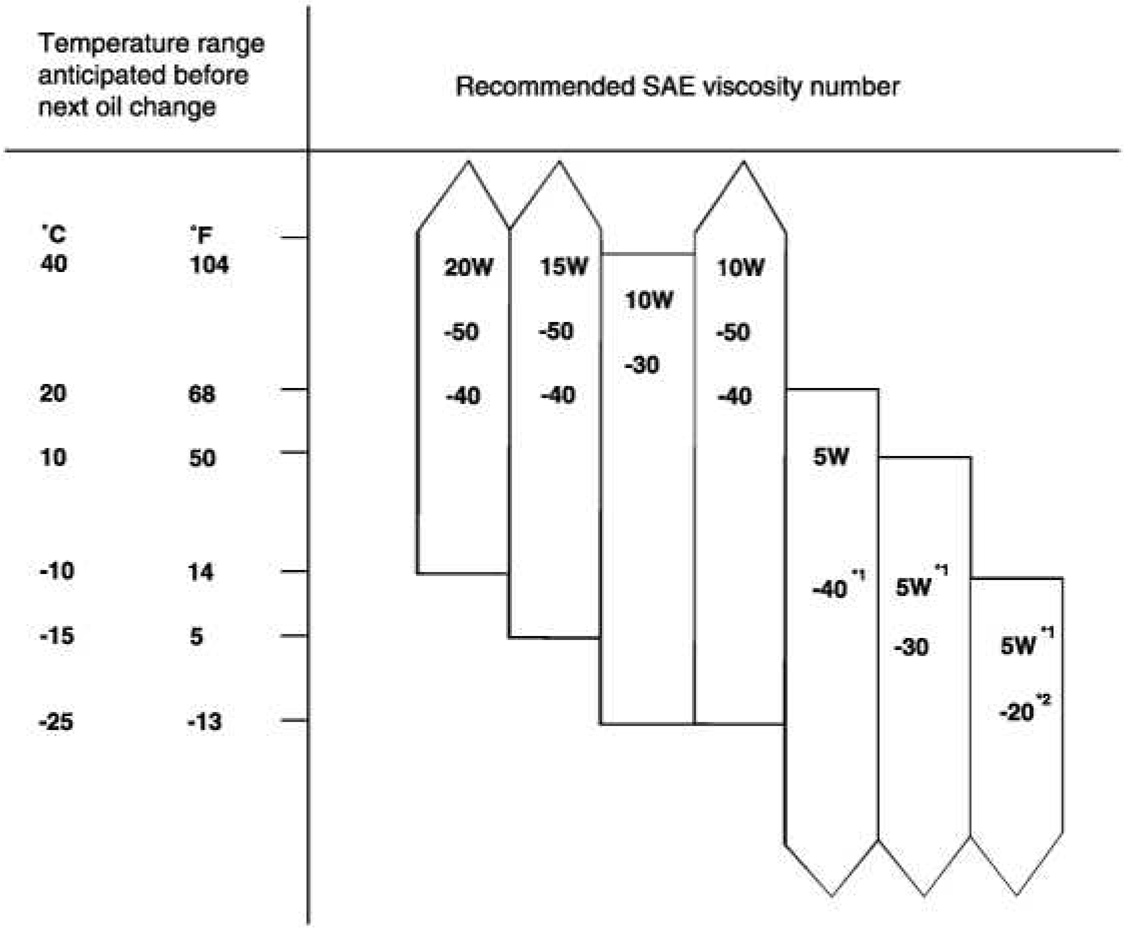
WARNING

Always use Genuine Hyundai parts and recommedended fluid.
Using any other type of parts and fluid can cause serious damage of the vehicle.

LUBRICANTS CAPACITIES

Description		Capacities [liter (U.S. qus., lmp.qts.)]
		1.5/1.6
Engine oil	Oil pan	3.0 (3.17, 2.64)
	Oil filter	0.3 (0.32, 0.26)
	Total	3.3 (3.49, 2.90)
Cooling system		6.5 (6.87, 5.72)
Manual transaxle		2.15 (2.3, 1.86)
Automatic transaxle		6.1 (6.45, 5.37)
Power steering		0.9 (0.95, 0.79)

SELECTION OF ENGINE OIL
Recommended SAE viscosity grades :



*1 Restricted by driving condition and environment.
*2 Not recommended for sustained high speed vehicle operation

NOTE

For best performance and maximum protection of all types of operation, select only those lubricants which :

1. Satisfy the requirements of the API classification.
2. Have the proper SAE grade number for expected ambient temperature range.

GENERAL SERVICE INFORMATION

PROTECTION OF THE VEHICLE

Always be sure to cover fenders, seats, and floor areas before starting work.

CAUTION

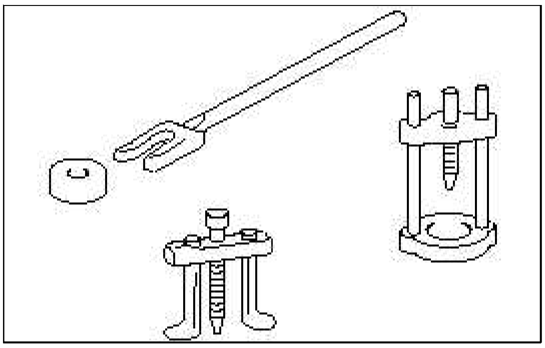
The support rod must be inserted into the hole near the edge of the hood whenever you inspect the engine compartment to prevent the hood from falling and possibly causing injury.
Make sure that the support rod has been released prior to closing the hood. Always check to be sure the hood is firmly latched before driving the vehicle.

PREPARATION OF TOOLS AND MEASURING EQUIPMENT

Be sure that all necessary tools and measuring equipment are available before starting work.

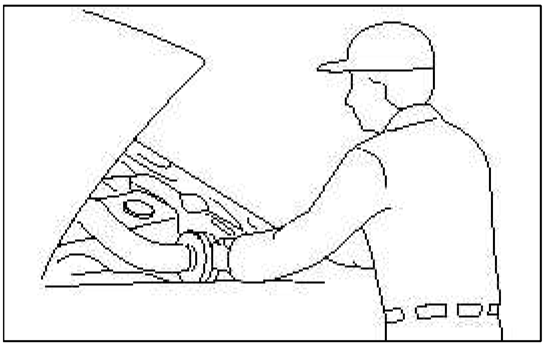
SPECIAL TOOLS

Use special tools when they are required.



REMOVAL OF PARTS

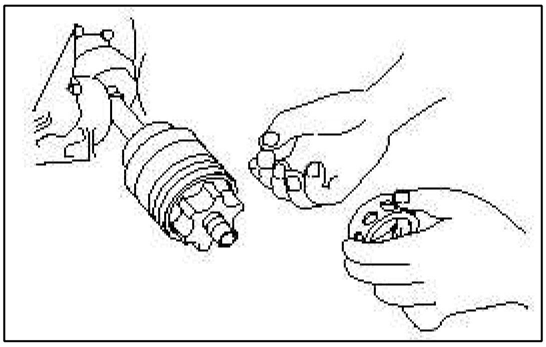
First find the cause of the problem and then determine whether removal or disassembly before starting the job.



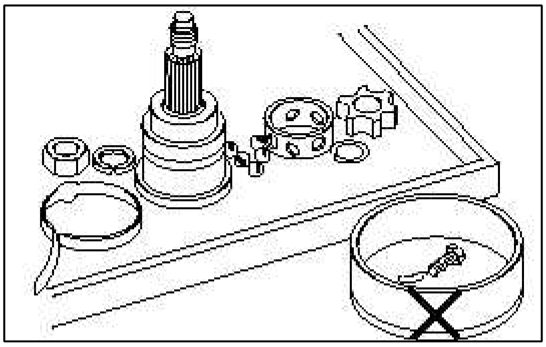
DISASSEMBLY

If the disassembly procedure is complex, requiring many parts to be disassembled, all parts should be disassembled in a way that will not affect their performance or external appearance.

1. **Inspection of parts**
   Each part, when removed, should be carefully inspected for malfunction, deformation, damage, and other problems.

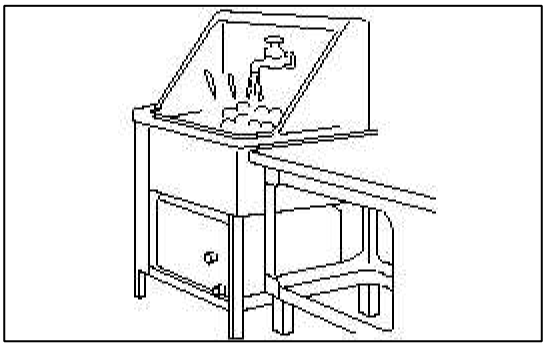


2. **Arrangement of parts**
   All disassembled parts should be carefully arranged for effective reassembly.
   Be sure to separate and correctly identify the parts to be replaced from those that will be used again.



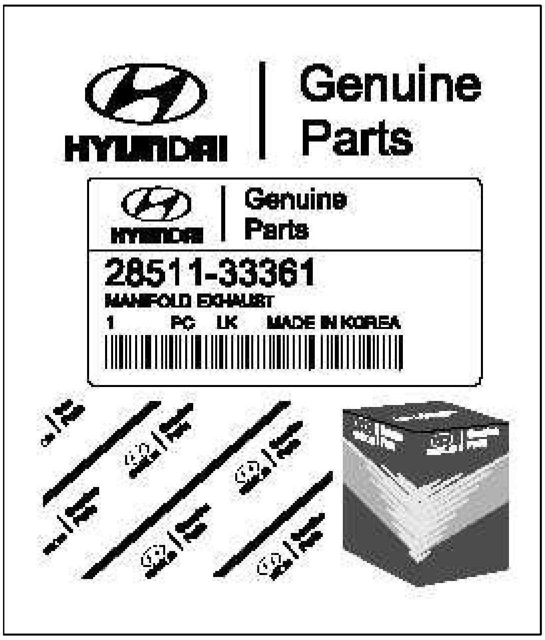
3. **Cleaning parts for reuse**

   All parts to be used again should be carefully and thoroughly cleaned by an appropriate method.



PARTS

When replacing parts, use HYUNDAI genuine parts.

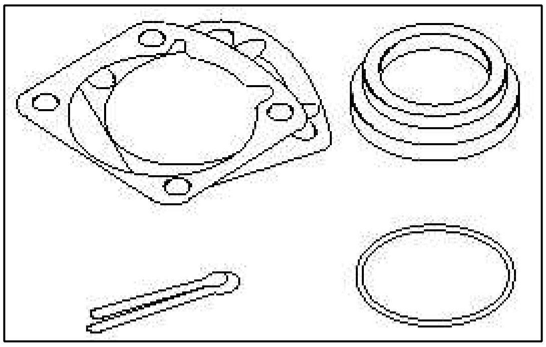

HYUNDAI
Genuine Parts
HYUNDAI
Genuine Parts
28511-33361
MANIFOLD EXHAUST
1 PC LK MADE IN KOREA

REPLACEMENT

Standard values, such as torques and certain adjustments, must be strictly observed in the reassembly of all parts.

If removed, the following parts should always be replaced with new ones.

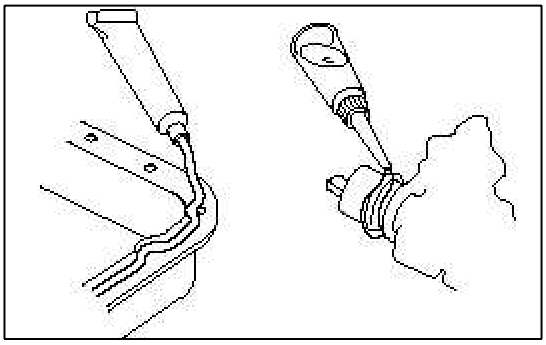
1. Oil seals
2. Gaskets
3. O-rings
4. Lock washers
5. Cotter pins (split pins)
6. Plastic nuts



   Depending on their location.

7. Sealant should be applied to gaskets.

8. Oil should be applied to the moving components of parts.
9. Specified oil or grease should be applied to the prescribed locations (oil seals, etc.) before assembly.

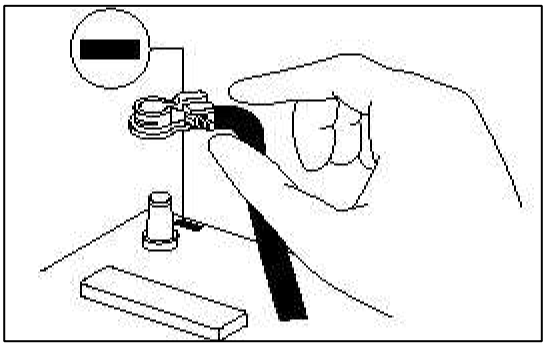


ADJUSTMENT

Use gauges and testers to correctly adjust the parts to standard values.

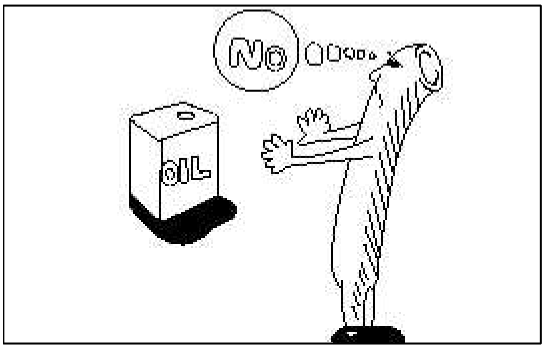
ELECTRICAL SYSTEM

1. Be sure to disconnect the battery cable from the negative (-) terminal of the battery.
2. Never pull on the wires when disconnecting connectors.
3. Locking connectors will click when the connector is secure.
4. Handle sensors and relays carefully. Be careful not to drop them against other parts.



RUBBER PARTS AND TUBES

Always prevent gasoline or from touching rubber parts or tubing.



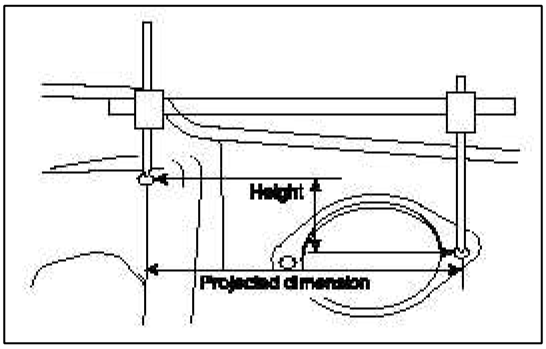
MEASURING BODY DIMENSIONS

1. Basically, all measurements in this manual are taken with a tracking gauge.
2. When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
3. For measuring dimensions, both projected dimensioners and actualmeasurement dimensions are used in this manual.

PROJECTED DIMENSIONS

1. These are the dimensions measured when the measurement points are projected from the vehicle's surface, and are the reference dimensions used for body alterations.

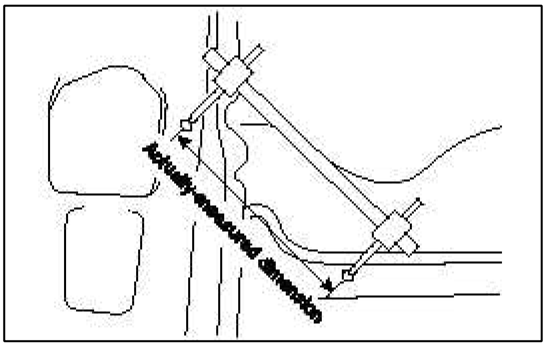
2. If the length of the tracking gauge probes is adjustable, measure it by lengthening one of two probes as long as the difference value in height of the two surface.



MEASURING ACTUAL DIMENSIONS

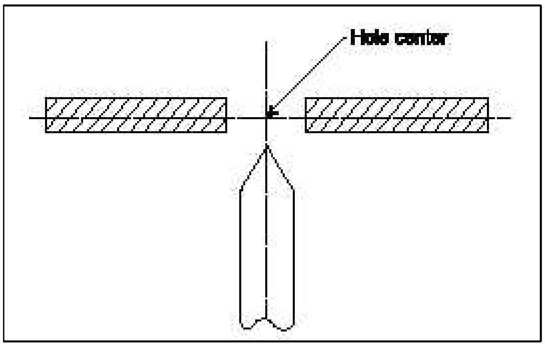
1. These dimensions indicate the actual linear distance between measurement points, and are used as the reference dimensions when a tracking gauge is used for measurement.
2. First adjust both probes to the same length (A=A') before measurement.

> NOTE
>
> Check the probes and gauge itself to make sure there is no free play.



MEASUREMENT POINT

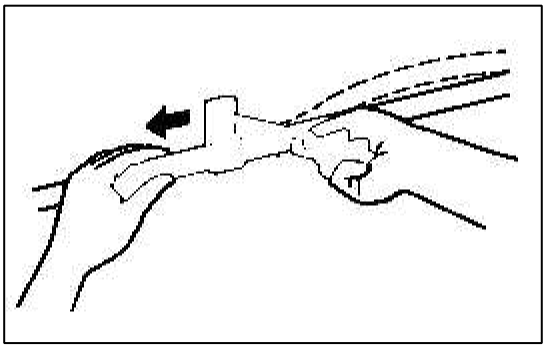
Measurements should be taken at the center of the hole.



CHECKING CABLES AND WIRES

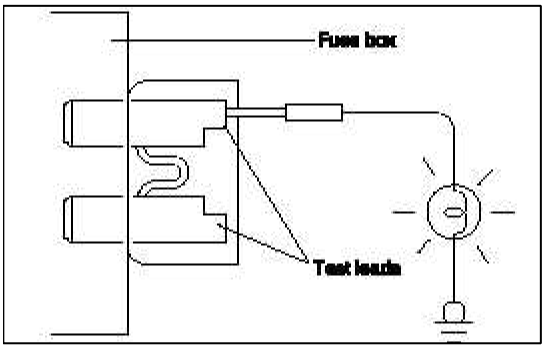
1. Check the terminal for tightness.
2. Check terminals and wires for corrosion from battery electrolyte, etc.
3. Check terminals and wires for open circuits.
4. Check wire insulation and coating for damage, cracks and degrading.
5. Check the conductive parts of terminals for contact with other metallic parts (vehicle body and other parts).
6. Check grounded parts firmly that there is complete continuity between their attaching bolt(s) and the vehicle's body.
7. Check for incorrect wiring.
8. Check that the wiring is clamped to prevent contact with sharp corners of the vehicle body or hot parts (exhaust manifold, etc.).

9. Check that the wiring is clamped firmy to provide enough clearance from the fan pulley, fan belt and other rotating or moving parts.
10. Check that the wiring has a little space so that it can vibrate between fixed and moving parts such as the vehicle body and the engine.



CHECK FUSES

A blade type fuse test leads provided to allow checking the fuse itself without removing it from the fuse box. The fuse is good if the test lamp lights up when one lead is connected to the test leads (one at a time) and the other lead is grounded. (Turn on the ignition switch so that the fuse circuit becomes operative)

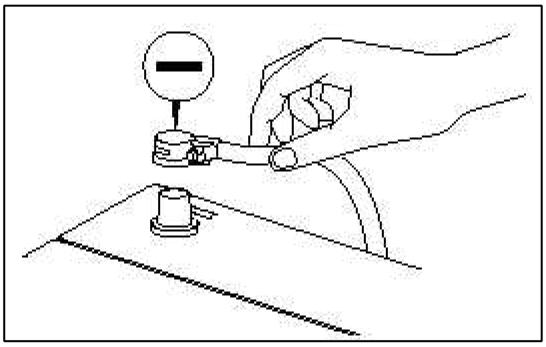


SERVICING THE ELECTRICAL SYSTEM

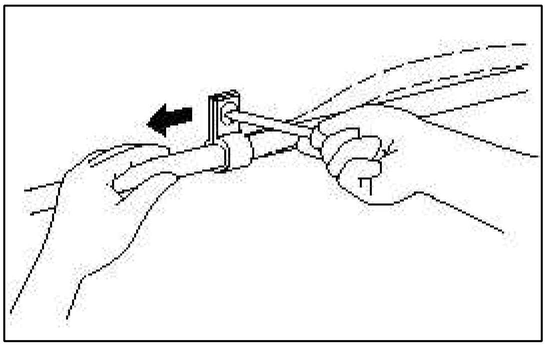
1. Prior to servicing the electrical system, be sure to turn off the ignition switch and disconnect the battery ground cable.

NOTE

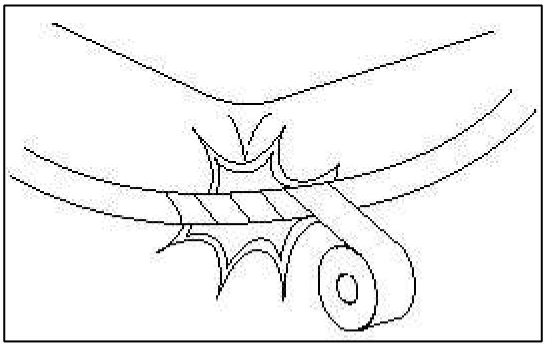
In the course of MFI or ELC system diagnosis, when the battery cable is removed, any diagnostic trouble code retained by the computer will be cleared. Therefore, if necessary, read the diagnostic before removing the battery cable.



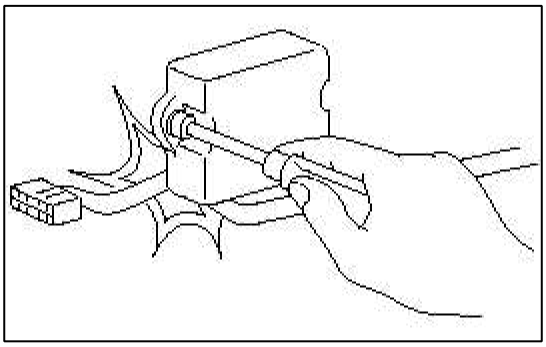
2. Attach the wiring harnesses with clamps so that there is no slack. However, for any harness which passes the engine or other vibrating parts of the vehicle, allow some slack within a range that does not allow the engine vibrations to cause the harness to come into contact with any of the surrounding parts and then secure the harness by using a clamp.



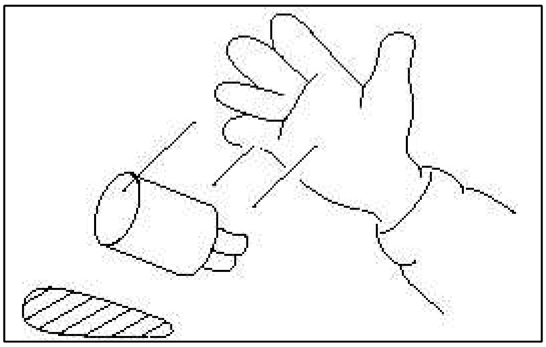
3. If any section of a wiring harness interferes with the edge of a parts, or a corner, wrap the section of the harness with tape or something similar in order to protect it from damage.



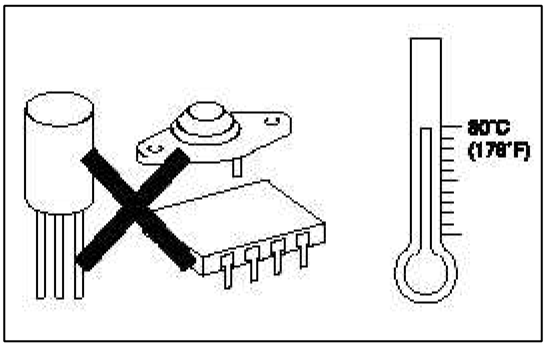
4. When installing any parts, be careful not to pinch or damage any of the wiring harness.



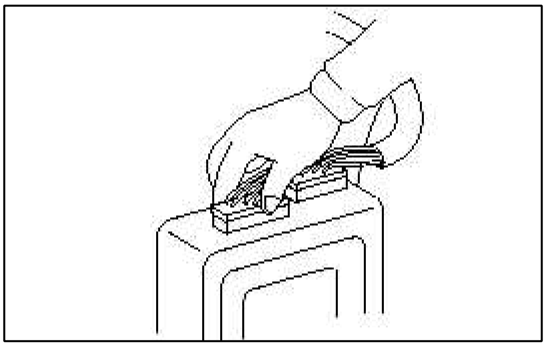
5. Never throw relays, sensors or electrical parts, or expose them to strong shock.



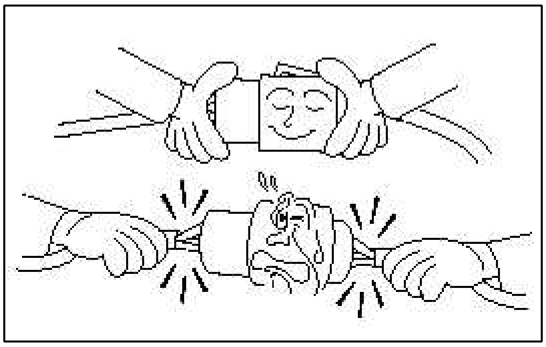
6. The electronic parts used in the computer, relays, etc. are readily damaged by heat. If there is a need for service operations that may cause the temperature to exceed 80°C (176°F), remove the electronic parts beforehand.



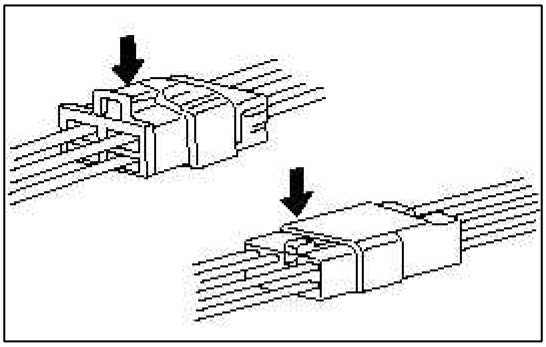
7. Loose connectors cause problems. Make sure that the connectors are always securely fastened.



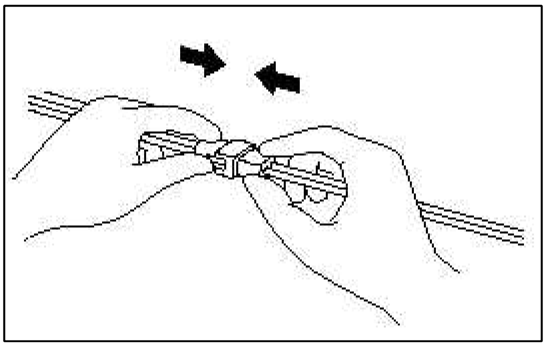
8. When disconnecting a connector, be sure to grip only the connector, not the wires.



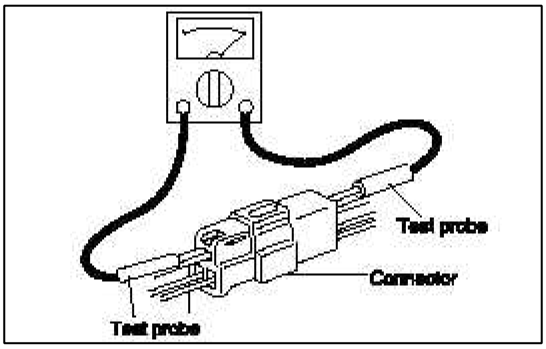
9. Disconnect connector which have catches by pressing in the direction of the arrows shown in the illustration.



10. Connect connectors which have catches by inserting the connectors until they make a clicking sound.



11. When using a circuit tester to check continuity or voltage on connector terminals, insert the test probe into the harness side. If the connector is a sealed connector, insert the test probe through the hole in the rubber cap until contacts the terminal, being careful not to damage the insulation of the wires.



12. To avoid overloading the wiring, take the electrical current load of the optional equipment into consideration, and determine the appropriate wire size.

Nominal size	**SAE gauge No.**	**Permissible current**	
		In engine compartment	**Other areas**
0.3mm²	AWG 22	-	5A
0.5mm²	AWG 20	7A	13A
0.85mm²	AWG 18	9A	17A
1.25mm²	AWG 16	12A	22A
2.0mm²	AWG 14	16A	30A
3.0mm²	AWG 12	21A	40A
5.0mm²	AWG 10	31A	54A

PRECAUTIONS FOR CATALYTIC CONVERTER

CAUTION

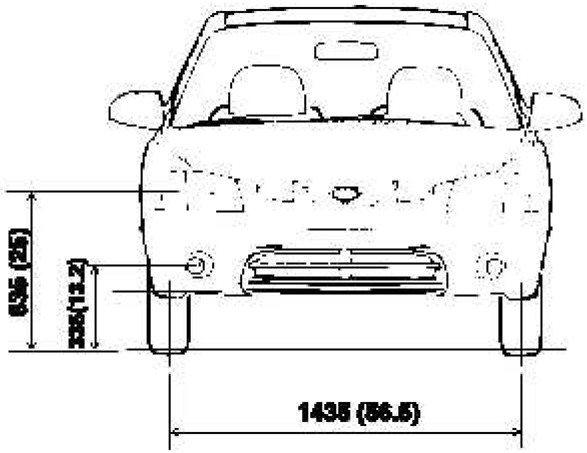
If a large amount of unburned gasoline flows into the converter, it may overheat and create a fire hazard. To prevent this observe the following precations and explain them to your customer.

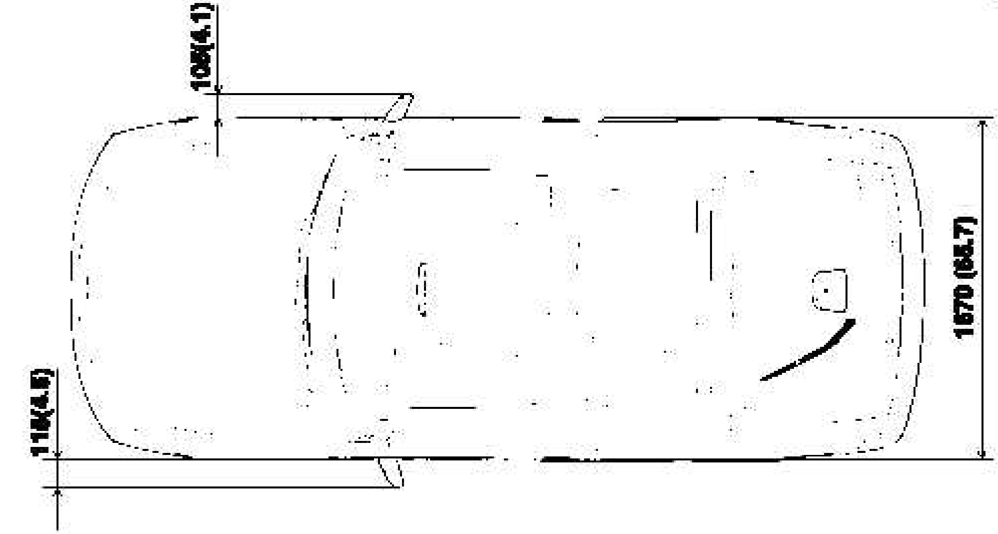
1. Use only unleaded gasoline.
2. Do not run the engine while the car is at rest for a long time. Avoid running the engine at fast idle for more than 10minutes and idle speed for more than 20 minutes.
3. Avoid start-jump tests. Do start-jumps only when absolutely necessary. Perform this test as rapidly as possible and, while testing, never race the engine.
4. Do not measure engine compression for an extended time. Engine compression tests must be made as rapidly as possible.
5. Avoid coasting with the ignition turned off and during prolonged braking.
6. Do not dispose of used catalytic converter with parts contaminated by gasoline or oil.

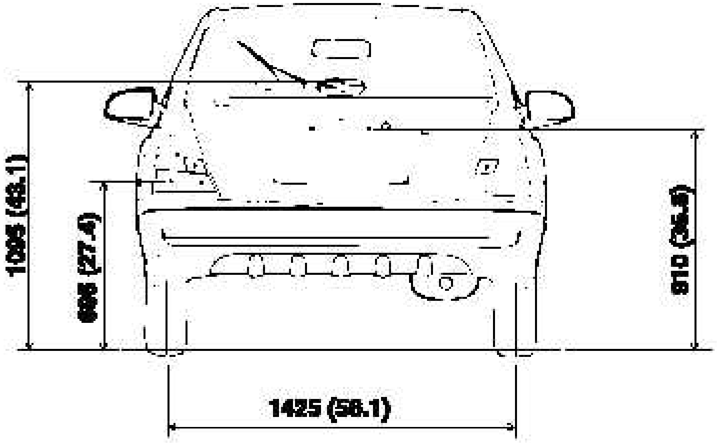
BODY DIMENSION

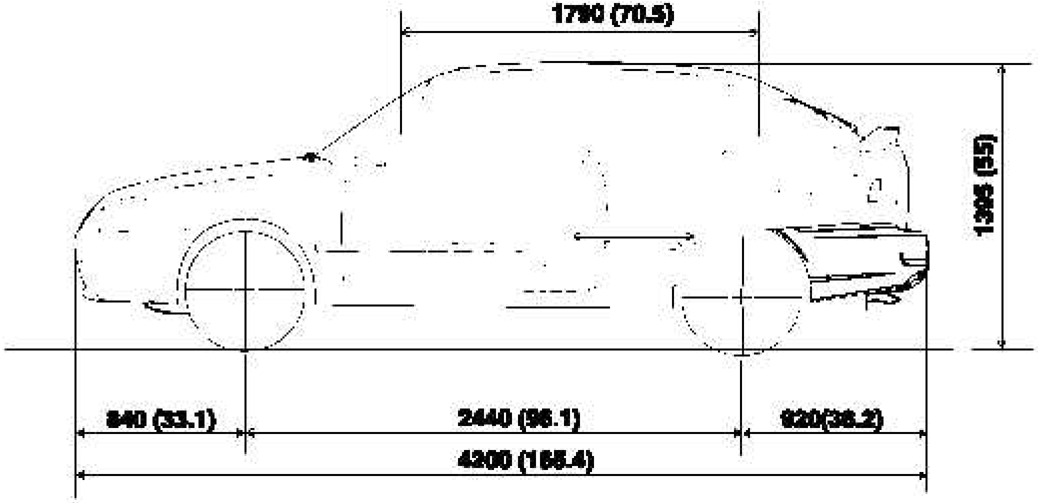
3 - DOOR

Unit : mm(In.)


635 (25)
335(13.2)
1435 (56.5)

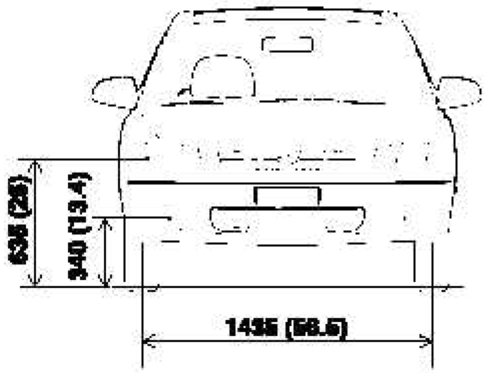

105(4.1)
115(4.5)
1670 (65.7)

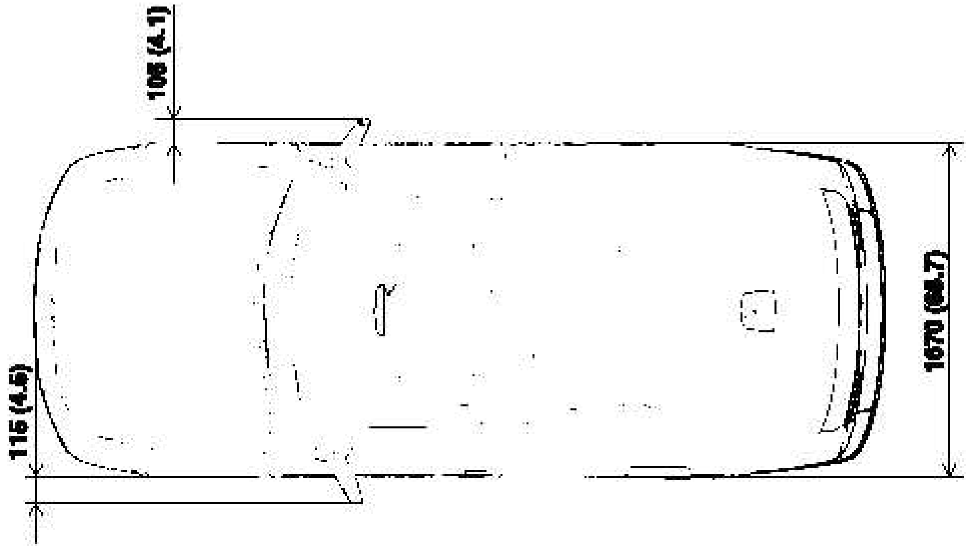

1095 (43.1)
695 (27.4)
910 (35.8)
1425 (56.1)

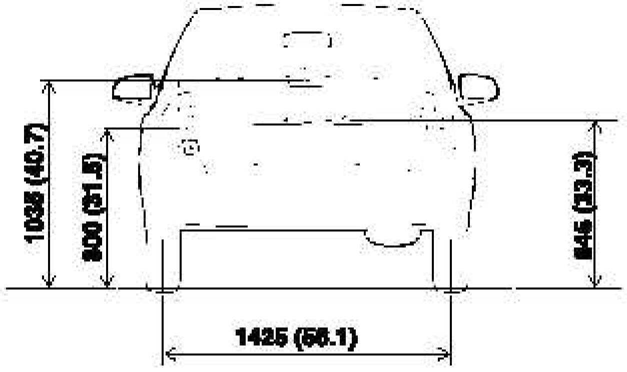

1790 (70.5)
1395 (55)
840 (33.1)
2440 (96.1)
920(36.2)
4200 (165.4)

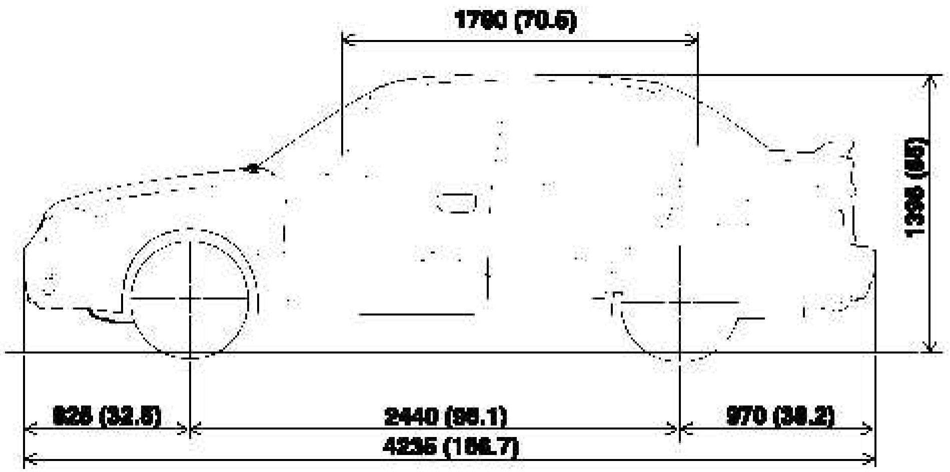
4 - DOOR

Unit : mm(In.)


635 (25)
340 (13.4)
1435 (56.5)


105 (4.1)
115 (4.5)
1670 (65.7)

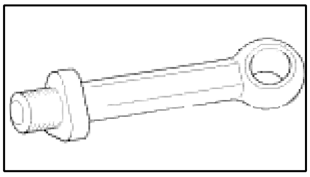
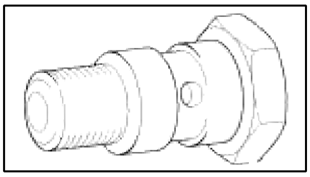
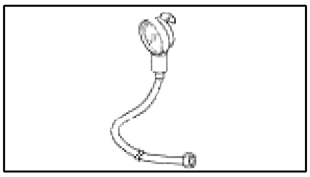
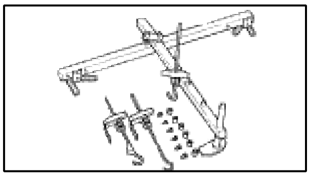
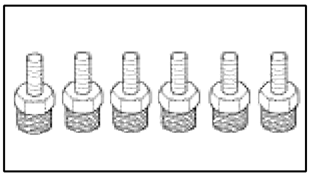

1035 (40.7)
800 (31.5)
845 (33.3)
1425 (56.1)


1760 (70.5)
1396 (55)
825 (32.5)
2440 (96.1)
970 (38.2)
4235 (166.7)

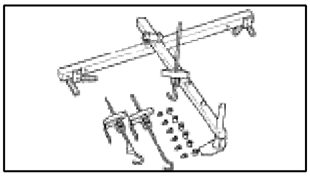
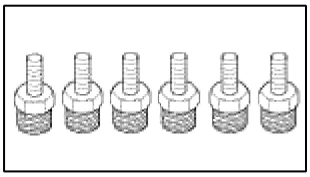
ACCENT(LC) > 2005 > G 1.5 SOHC > Automatic Transaxle System

Automatic Transaxle System > General Information > Special Service Tools

SPECIAL TOOLS (A/T)

Tool (Number and Name)	Illustration	Use
09452-21001 Oil pressure gauge adapter		Measurement of the oil pressure (Use with 092452-21002, 09452-21500)
09452-21002 Oil pressure gauge adapter		Measurement of the oil pressure (Use with 09452-21500 and 09452-21001)
09452-21500 Oil pressure gauge		Measurement of the oil pressure (Use with 09452-21001 and 09452-21002)
J28467-B Engine support fixtrue		Removal and installation of transaxle assembly
J28467-125 Engine support adapters		Use with J28467-B

SPECIAL TOOLS (M/T)

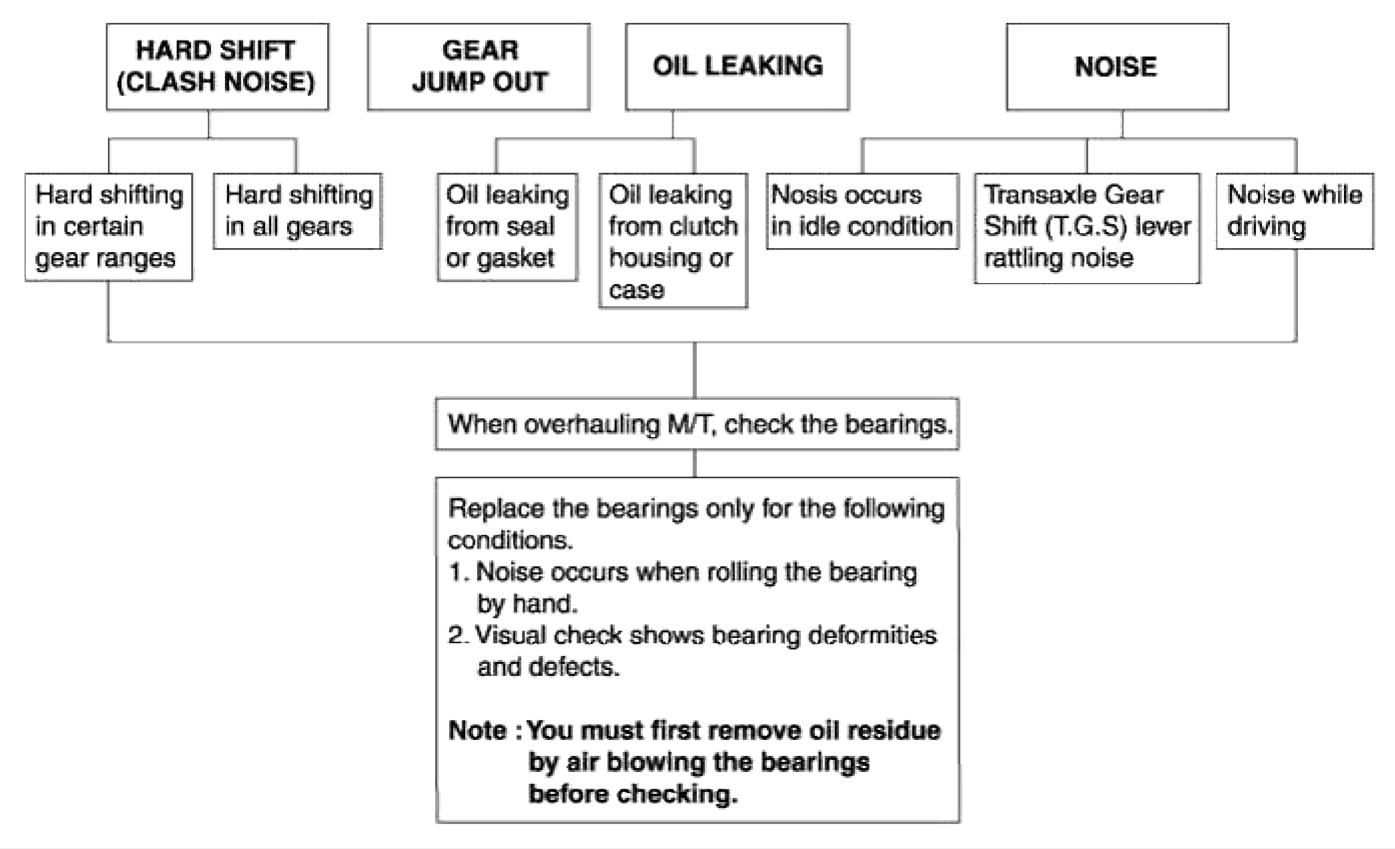
Tool (Number and Name)	Illustration	Use
J28467-B Engine support fixture		Removal and installation of transaxle assembly
J28467-125 Engine support adapters		Use with J28467-B

Automatic Transaxle System > General Information > Troubleshooting

TROUBLESHOOTING (M/T)

Symptom	Probable cause	Remedy
Vibration, noise	Loose or damaged transaxle and engine mounts	Tighten or replace mounts
	Inadequate shaft end play	Correct end play
	Worn or damaged gears	Replace gears
	Inadequate grade of oil	Replace with specified oil
	Low oil level	Replenish
	Inadequate engine idle speed	Adjust idle speed
Oil leakage	Broken or damaged, oil seal or O-ring	Replace control cable
Hard shift	Faulty control cable	Replace control cable
	Poor contact or wear of synchronizer ring and gear cone	Correct or replace
	Weakened synchronizer spring	Replace synchronizer spring
	Inadequate grade of oil	Replace with specified oil
Jumps out of gear	Worn gear shift fork or broken poppet spring	Replace shift fork or poppet spring
	Synchronizer hub-to-sleeve spline clearance too large	Replace synchronizer hub and sleeve

PROBLEM CHART (M/T)

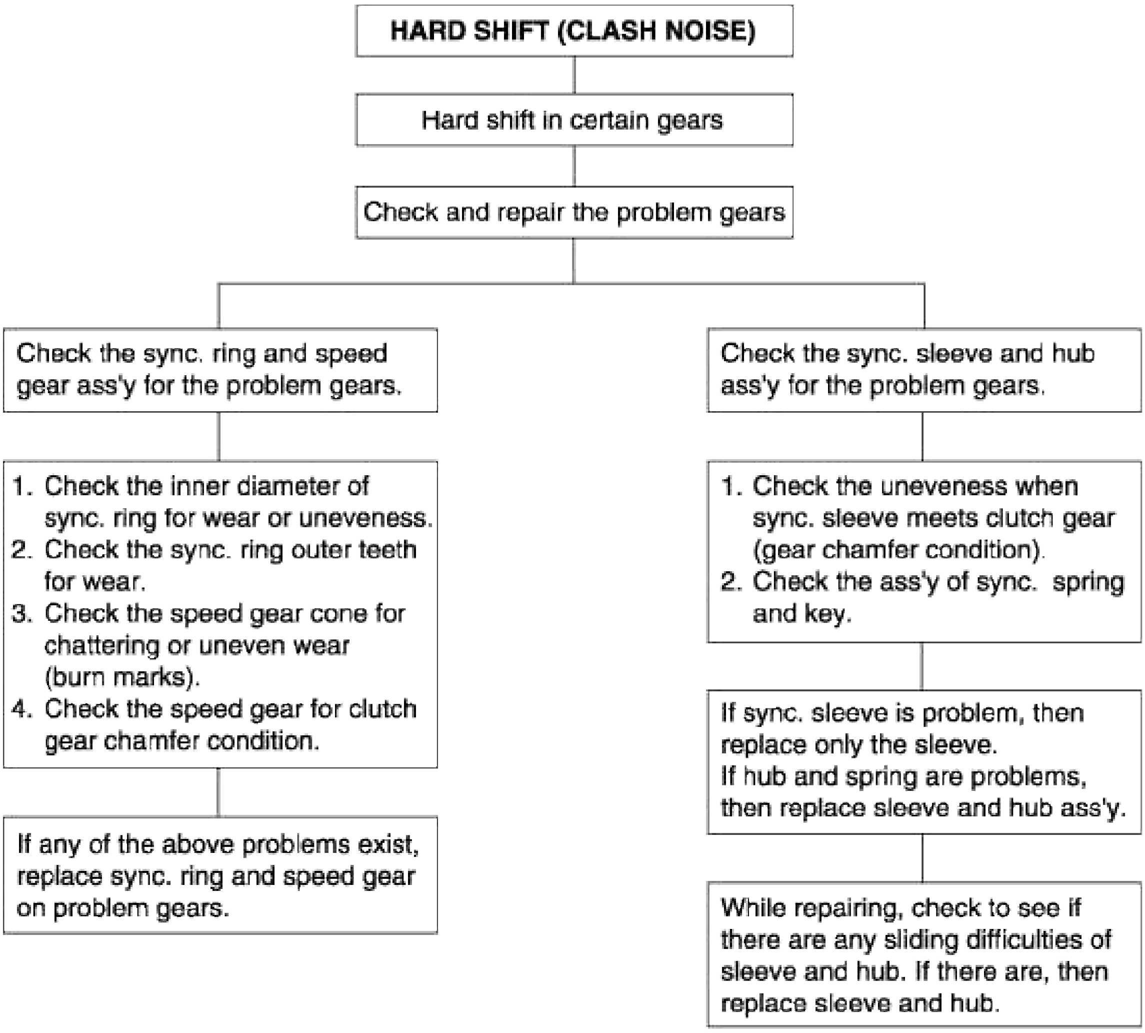

HARD SHIFT (CLASH NOISE)
GEAR JUMP OUT
OIL LEAKING
NOISE
Hard shifting in certain gear ranges
Hard shifting in all gears
Oil leaking from seal or gasket
Oil leaking from clutch housing or case
Nosis occurs in idle condition
Transaxle Gear Shift (T.G.S) lever rattling noise
Noise while driving

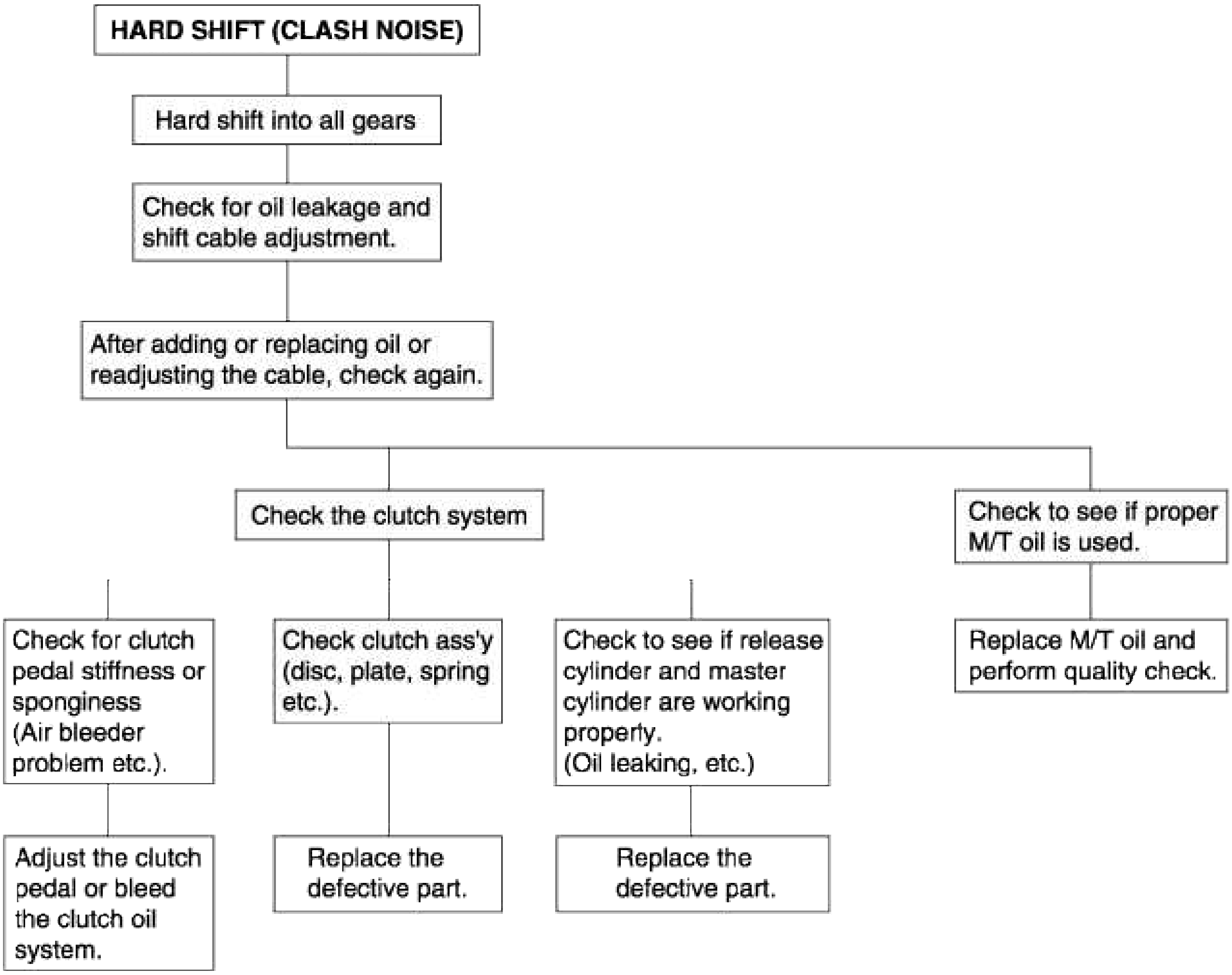
When overhauling M/T, check the bearings.

Replace the bearings only for the following conditions.

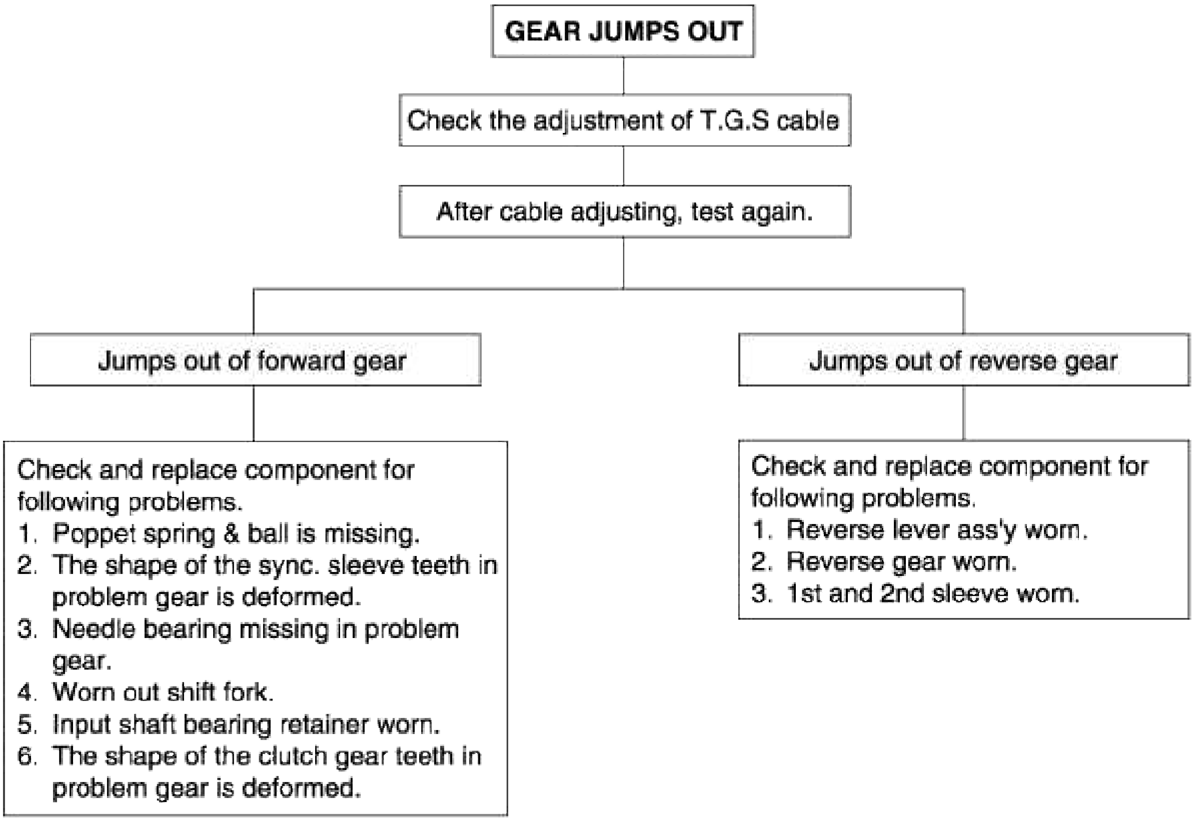
1. Noise occurs when rolling the bearing by hand.
2. Visual check shows bearing deformities and defects.

Note : You must first remove oil residue by air blowing the bearings before checking.


HARD SHIFT (CLASH NOISE)
Hard shift in certain gears
Check and repair the problem gears
Check the sync. ring and speed gear ass'y for the problem gears.
1. Check the inner diameter of sync. ring for wear or uneveness.
2. Check the sync. ring outer teeth for wear.
3. Check the speed gear cone for chattering or uneven wear (burn marks).
4. Check the speed gear for clutch gear chamfer condition.
If any of the above problems exist, replace sync. ring and speed gear on problem gears.
Check the sync. sleeve and hub ass'y for the problem gears.
1. Check the uneveness when sync. sleeve meets clutch gear (gear chamfer condition).
2. Check the ass'y of sync. spring and key.
If sync. sleeve is problem, then replace only the sleeve.
If hub and spring are problems, then replace sleeve and hub ass'y.
While repairing, check to see if there are any sliding difficulties of sleeve and hub. If there are, then replace sleeve and hub.


HARD SHIFT (CLASH NOISE)
Hard shift into all gears
Check for oil leakage and shift cable adjustment.
After adding or replacing oil or readjusting the cable, check again.
Check the clutch system
Check to see if proper M/T oil is used.
Check for clutch pedal stiffness or sponginess (Air bleeder problem etc.).
Check clutch ass'y (disc, plate, spring etc.).
Check to see if release cylinder and master cylinder are working properly. (Oil leaking, etc.)
Replace M/T oil and perform quality check.
Adjust the clutch pedal or bleed the clutch oil system.
Replace the defective part.
Replace the defective part.

Before performing any work, check the driving habits of customers :
If shifting occurs as the clutch is being pressed, then hard shifting would occur in all gears.



GEAR JUMPS OUT

Check the adjustment of T.G.S cable

After cable adjusting, test again.

Jumps out of forward gear

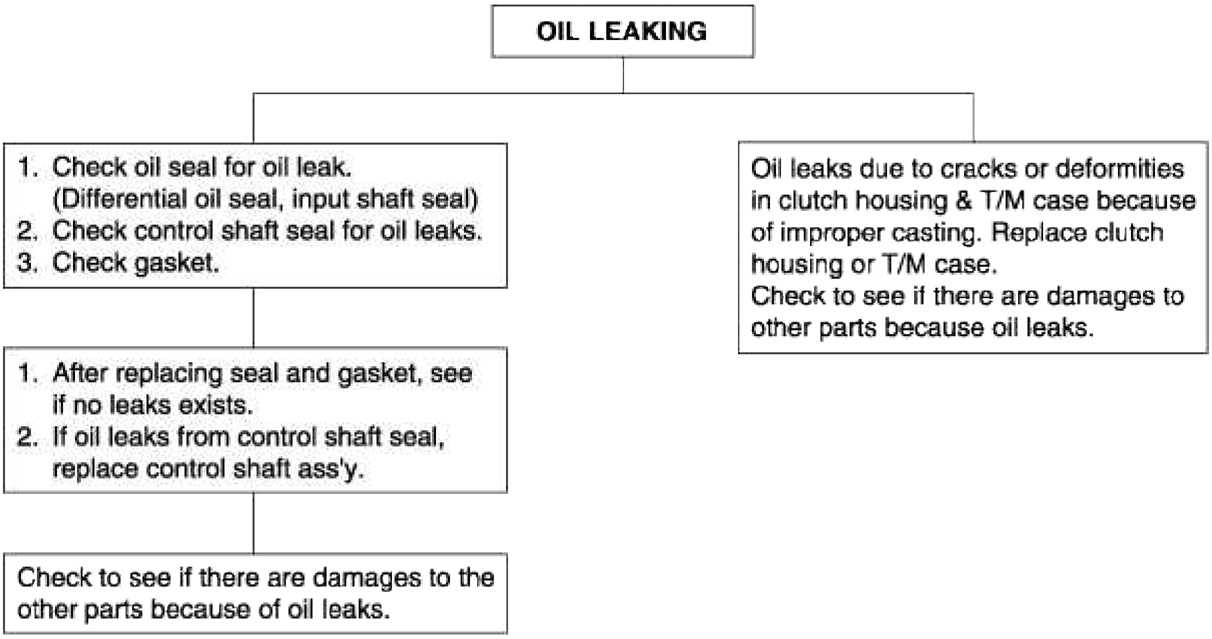
Check and replace component for following problems.

1. Poppet spring & ball is missing.
2. The shape of the sync. sleeve teeth in problem gear is deformed.
3. Needle bearing missing in problem gear.
4. Worn out shift fork.
5. Input shaft bearing retainer worn.
6. The shape of the clutch gear teeth in problem gear is deformed.

Jumps out of reverse gear

Check and replace component for following problems.

1. Reverse lever ass'y worn.
2. Reverse gear worn.
3. 1st and 2nd sleeve worn.



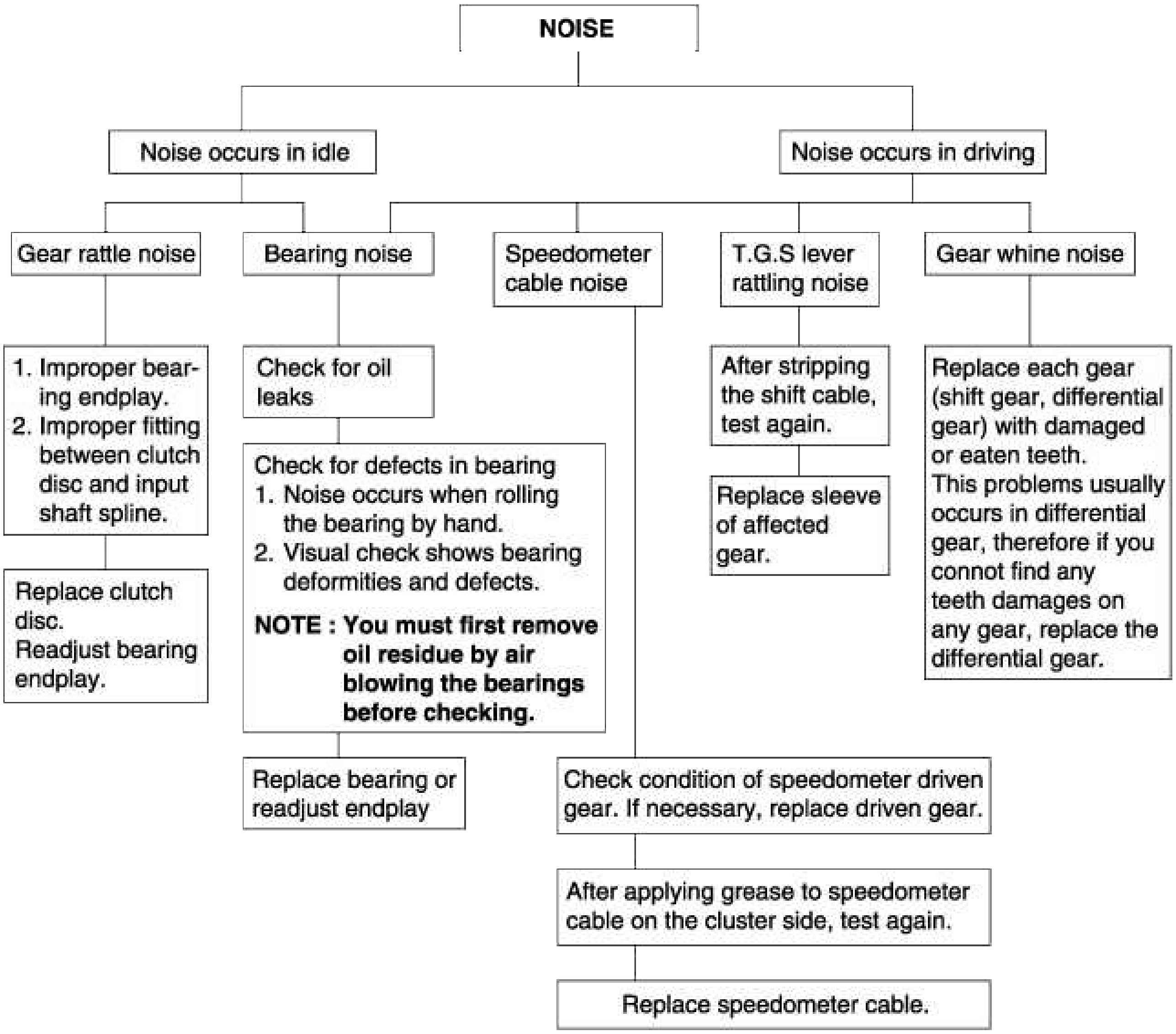
OIL LEAKING

1. Check oil seal for oil leak. (Differential oil seal, input shaft seal)
2. Check control shaft seal for oil leaks.
3. Check gasket.

1. After replacing seal and gasket, see if no leaks exists.
2. If oil leaks from control shaft seal, replace control shaft ass'y.

Check to see if there are damages to the other parts because of oil leaks.

Oil leaks due to cracks or deformities in clutch housing & T/M case because of improper casting. Replace clutch housing or T/M case.
Check to see if there are damages to other parts because oil leaks.


NOISE
Noise occurs in idle
Noise occurs in driving
Gear rattle noise
Bearing noise
Speedometer cable noise
T.G.S lever rattling noise
Gear whine noise
1. Improper bearing endplay.
2. Improper fitting between clutch disc and input shaft spline.
Replace clutch disc.
Readjust bearing endplay.
Check for oil leaks
Check for defects in bearing
1. Noise occurs when rolling the bearing by hand.
2. Visual check shows bearing deformities and defects.
NOTE : You must first remove oil residue by air blowing the bearings before checking.
Replace bearing or readjust endplay
After stripping the shift cable, test again.
Replace sleeve of affected gear.
Replace each gear (shift gear, differential gear) with damaged or eaten teeth.
This problems usually occurs in differential gear, therefore if you connot find any teeth damages on any gear, replace the differential gear.
Check condition of speedometer driven gear. If necessary, replace driven gear.
After applying grease to speedometer cable on the cluster side, test again.
Replace speedometer cable.

Automatic Transaxle System > General Information > Specifications

SPECIFICATIONS (A/T)

Item		A4AF3	
Torque converter type		D3-element, 1-stage, 2-phase type	
Transaxle type		D4-speed forward, 1-speed reverse	
Engine displacement		1.5SOHC	1.6DOHC
Gear ratio	1st	2.846	←
	2nd	1.581	←
	3rd	1.000	←
	4th	0.685	←
Reverse		2.176	←
Final gear ratio		3.656	4.041
End play (mm)	Front clutch snap ring	0.5±0.1	
	Rear clutch snap ring	0.8±0.1	
	End clutch snap ring	0.5±0.1	
	Low and reverse brake snap ring	0.675~0.987	

TIGHTENING TORUQE (A/T)

Item	N·m	kg·cm	lb·ft
Shift lever mounting bolt	12-15	120-150	8-11
Starter motor mounting bolt	27-34	270-340	19-25
Shift lever cam rod nut	14-20	140-200	10-14
Knob and lever assembly	More than 2	More than 20	More than 1.4
Bell housing cover to engine	8-10	80-100	6-7
Transaxle mounting bracket to body frame	30-40	300-400	21-28
Transaxle mounting insulator bolt	90-110	900-1100	63-77
Front roll stopper to subframe	30-40	300-400	21-28
Front roll stopper insulator bolt	45-60	450-600	33-44
Rear roll stopper to subframe bolt	30-40	300-400	21-28
Rear roll stopper insulator bolt	45-60	450-600	33-44
Kick down servo lock nut	15-22	150-220	11-16
Lever indicator panel	More than 15	More than 150	More than 11
Oil drain plug, filler plug	30-35	300-350	22-25
Transaxle range switch	10-12	100-120	7-9

LUBRICANT

Items	Specified lubricant	Quantity
Transaxle fluid Lit. (U.S. qts., lmp.qts.)	DIAMOND ATF SP-III, SK ATF SP-III	6.1 (6.3, 5.3)
Drive shaft oil seal lip	Automatic transaxle fluid	As required
Sliding part of bushing	Chassis grease SAE J310, NLGI No.0	As required
Selector lever sliding portion	Multipurpose grease SAE J310, NLGI No.2	As required
Oil pan gasket	LOCTITE 5460	As required

SPECIFICATIONS (M/T)

Model		M5AF3	
Type		Forward 5 speed, reverse 1 speed	
Engine displacement		1.5SOHC	1.6DOHC
Gear ratio	First	3.615	3.615
	Second	2.053	2.053
	Third	1.370	1.370
	Fourth	0.971	1.031
	Fifth	0.825	0.825
	Reverse	3.250	3.250
Final gear ratio		3.650	3.842
Transaxle fluid		HYUNDAI GENUINE PARTS MTF 75W/90	
Capacity (Lit., u.s.qts, Imp.qts)		2.15 (2.27, 1.89)	

SERVICE SPECIFICATIONS (M/T)

Item	End play
Input shaft rear bearing end play	0.01L - 0.09L
Output shaft bearing end play	0.05T - 0.10T
Differential bearing end play	0.15T - 0.20T
Differential pinion end play	0.025L - 0.15L
Input shaft front bearing end play	0.01L - 0.12L

TIGHTENING TORQUE (M/T)

Item	N·m	Kg·cm	lb·ft
Shift lever mounting bolt	9-14	90-140	6-10
Clutch release cylinder	15-22	150-220	11-16
Control cable bracket	12-15	120-150	8-11
Front roll stopper to sub frame	30-40	300-400	21-28
Front roll stopper insulator bolt	45-60	450-600	33-44
Rear roll stopper to subframe bolt	30-40	300-400	21-28
Rear roll stopper insulator bolt	45-60	450-600	33-44
Transaxle mounting bracket to body frame	30-40	300-400	21-28
Transaxle mounting insulator bolt	90-110	900-1100	63-77

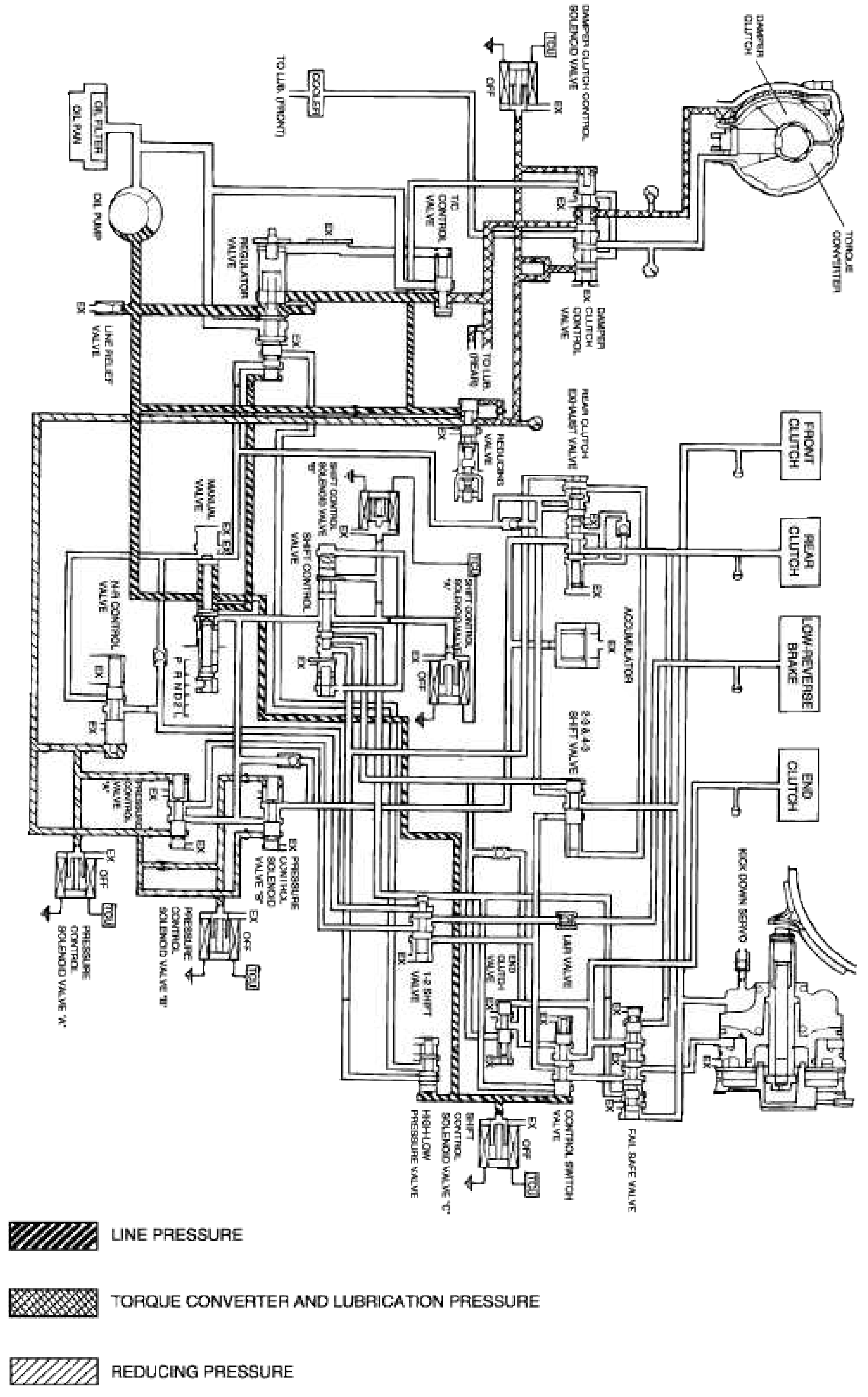
LUBRICANT (M/T)

Items	Specified lubricant	Quantity
Clutch release fork shaft&bushing	CASMOLY L9508	1g

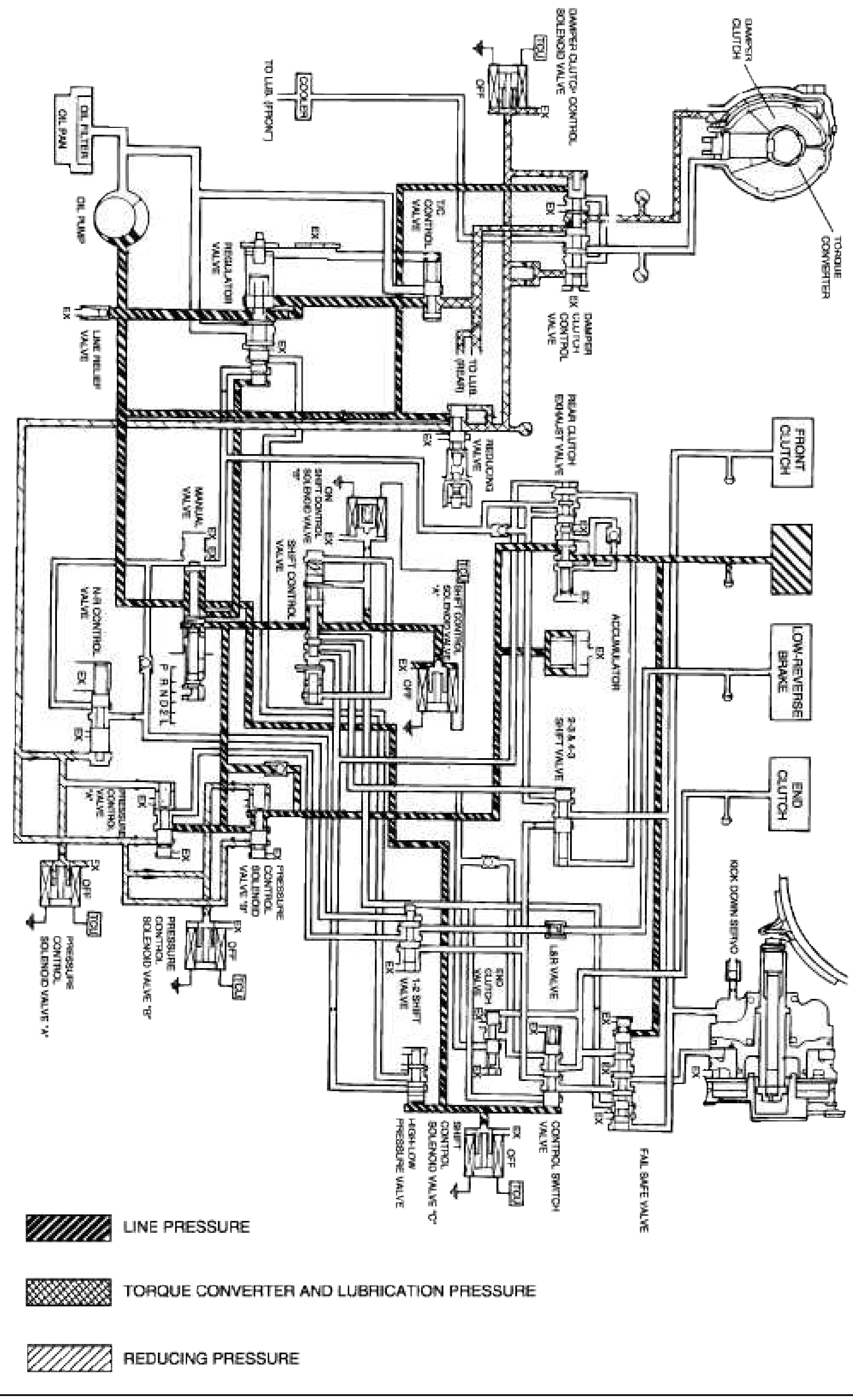
Automatic Transaxle System > Automatic Transaxle System > Flow Diagram

AUTOMATIC TRANSAXLE HYDRAULIC CIRCUIT

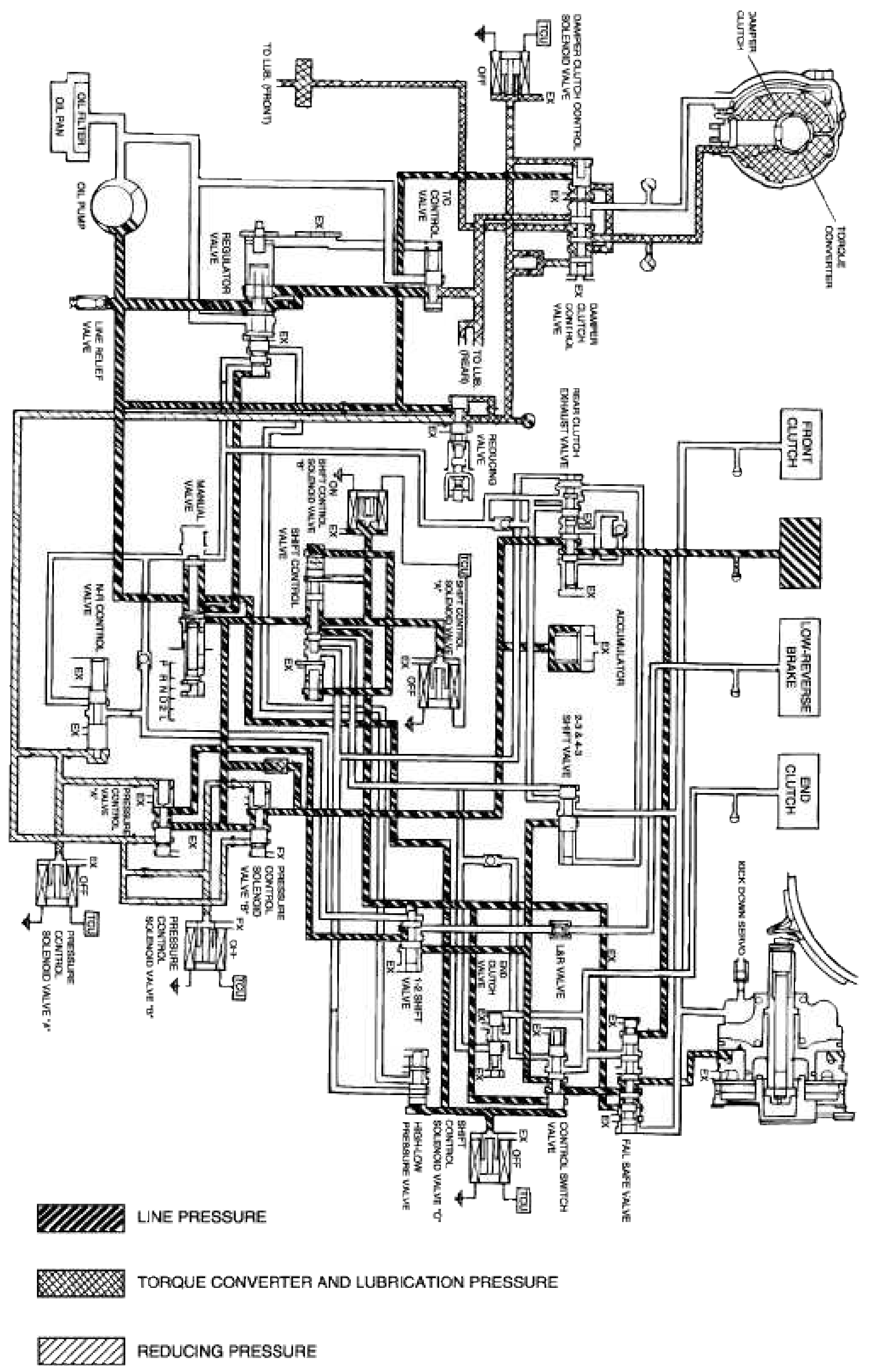
NEUTRAL & PARK


DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
EX
OFF
DAMPER CLUTCH
TORQUE CONVERTER
COOLER
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
REGULATOR VALVE
DAMPER CLUTCH CONTROL VALVE
TO LUB. (REAR)
LINE RELIEF VALVE
REDUCING VALVE
REAR CLUTCH EXHAUST VALVE
FRONT CLUTCH
REAR CLUTCH
LOW-REVERSE BRAKE
END CLUTCH
ACCUMULATOR
2-3 & 4-3 SHIFT VALVE
SHIFT CONTROL SOLENOID VALVE "B"
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
MANUAL VALVE
P R N D 2 L
N-R CONTROL VALVE
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "B"
KICK DOWN SERVO
L-R VALVE
END CLUTCH VALVE
1-2 SHIFT VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
SHIFT CONTROL SOLENOID VALVE "C"
HIGH-LOW PRESSURE VALVE
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

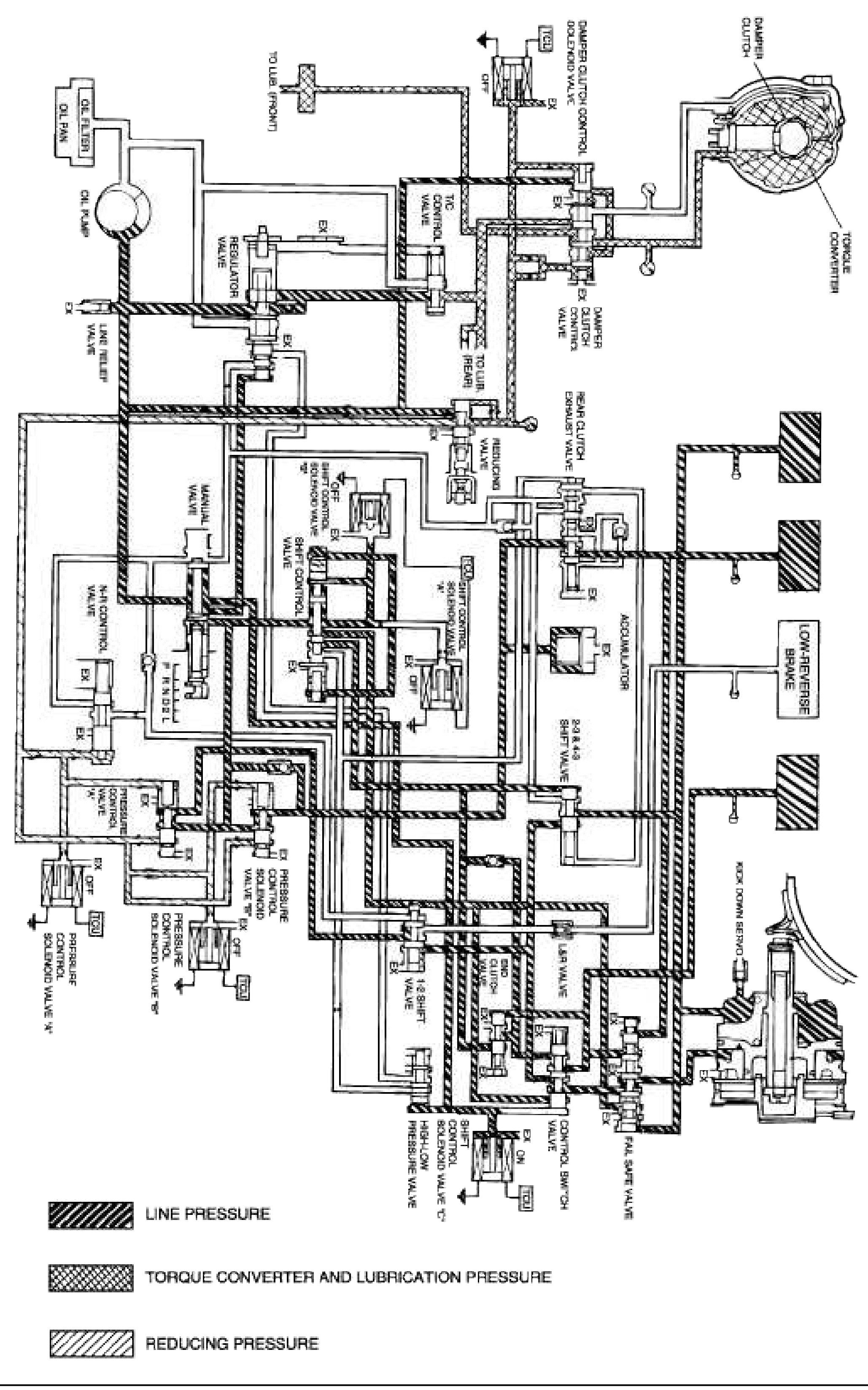
DRIVE (FIRST)


TORQUE CONVERTER
DAMPER CLUTCH
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
EX
COOLER
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
REGULATOR VALVE
DAMPER CLUTCH CONTROL VALVE
TO LUB. (REAR)
LINE RELIEF VALVE
REAR CLUTCH EXHAUST VALVE
REDUCING VALVE
FRONT CLUTCH
MANUAL VALVE
SHIFT CONTROL SOLENOID VALVE "B"
ON
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
N-R CONTROL VALVE
P R N D 2 L
ACCUMULATOR
LOW-REVERSE BRAKE
2-3 & 4-3 SHIFT VALVE
END CLUTCH
KICK DOWN SERVO
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "A"
PRESSURE CONTROL VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "B"
L-R VALVE
END CLUTCH VALVE
1-2 SHIFT VALVE
HIGH-LOW PRESSURE VALVE
SHIFT CONTROL SOLENOID VALVE "C"
CONTROL SWITCH VALVE
FAIL SAFE VALVE
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

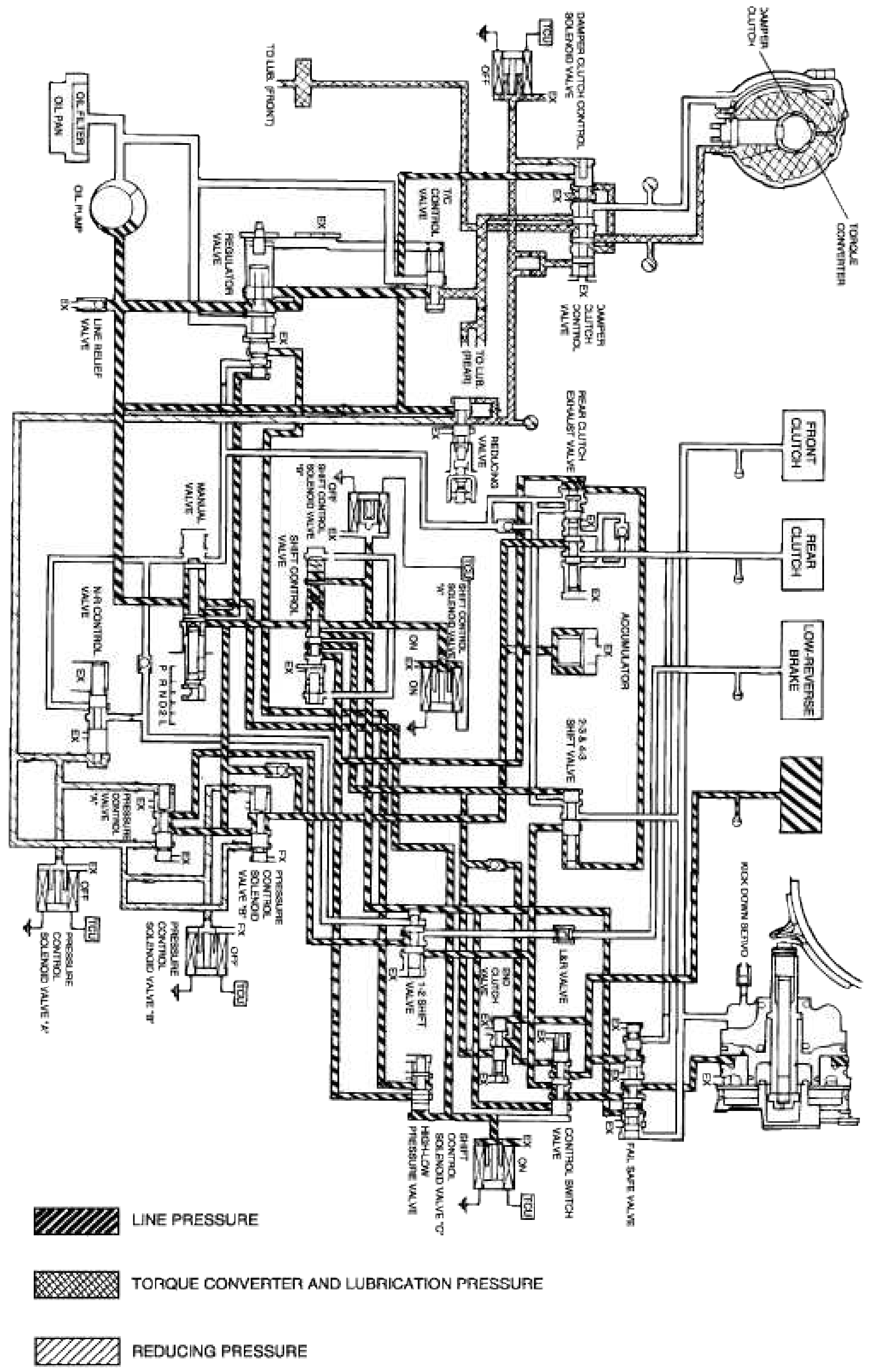
DRIVE (SECOND)


TORQUE CONVERTER
DAMPER CLUTCH
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
EX
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
DAMPER CLUTCH CONTROL VALVE
REGULATOR VALVE
LINE RELIEF VALVE
TO LUB. (REAR)
REDUCING VALVE
REAR CLUTCH EXHAUST VALVE
FRONT CLUTCH
SHIFT CONTROL SOLENOID VALVE "B"
ON
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
MANUAL VALVE
P R N D 2 L
N-R CONTROL VALVE
ACCUMULATOR
LOW-REVERSE BRAKE
2-3 & 4-3 SHIFT VALVE
END CLUTCH
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "B"
KICK DOWN SERVO
L&R VALVE
END CLUTCH VALVE
1-2 SHIFT VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
SHIFT CONTROL SOLENOID VALVE "C"
HIGH-LOW PRESSURE VALVE
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

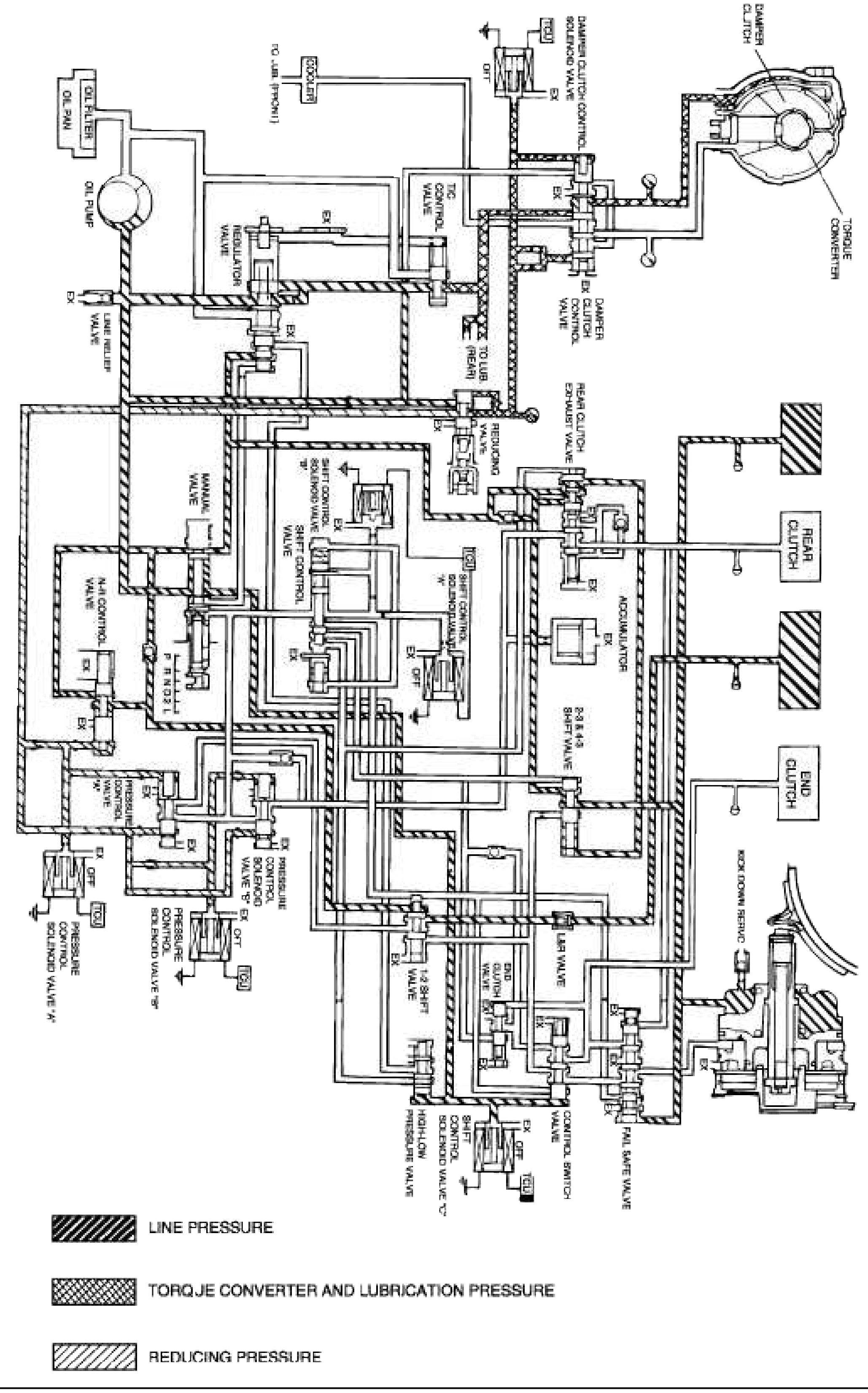
DRIVE (THIRD)


DAMPER CLUTCH
TORQUE CONVERTER
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
EX
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
REGULATOR VALVE
DAMPER CLUTCH CONTROL VALVE
TO LUB. (REAR)
LINE RELIEF VALVE
REAR CLUTCH EXHAUST VALVE
REDUCING VALVE
MANUAL VALVE
SHIFT CONTROL SOLENOID VALVE "B"
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
ACCUMULATOR
LOW-REVERSE BRAKE
N-R CONTROL VALVE
P R N D 2 L
2-3 & 4-3 SHIFT VALVE
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "A"
KICK DOWN SERVO
L&R VALVE
END CLUTCH VALVE
1-2 SHIFT VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
SHIFT CONTROL SOLENOID VALVE "C"
ON
HIGH-LOW PRESSURE VALVE
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

DRIVE (FOURTH)

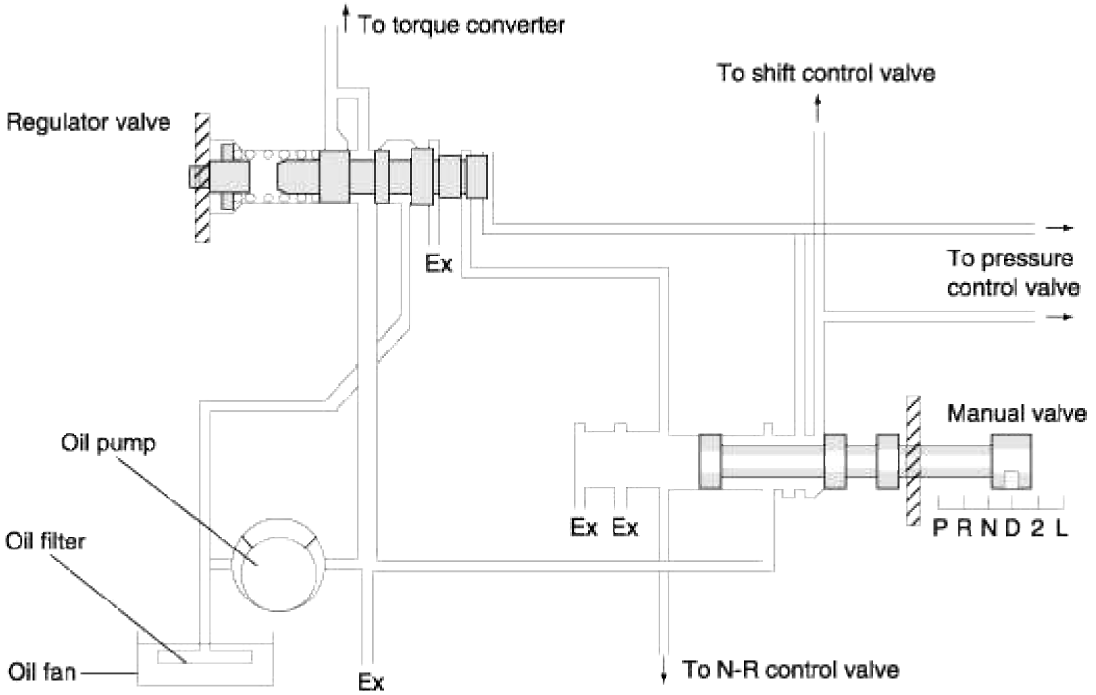

DAMPER CLUTCH
TORQUE CONVERTER
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
EX
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
REGULATOR VALVE
DAMPER CLUTCH CONTROL VALVE
LINE RELIEF VALVE
TO LUB. (REAR)
REAR CLUTCH EXHAUST VALVE
REDUCING VALVE
FRONT CLUTCH
REAR CLUTCH
LOW-REVERSE BRAKE
ACCUMULATOR
MANUAL VALVE
SHIFT CONTROL SOLENOID VALVE "B"
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
ON
N-R CONTROL VALVE
P R N D 2 L
2-3 & 4-3 SHIFT VALVE
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "A"
KICK DOWN SERVO
L&R VALVE
END CLUTCH VALVE
1-2 SHIFT VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
SHIFT CONTROL SOLENOID VALVE "C"
HIGH-LOW PRESSURE VALVE
LINE PRESSURE
TORQUE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

REVERSE

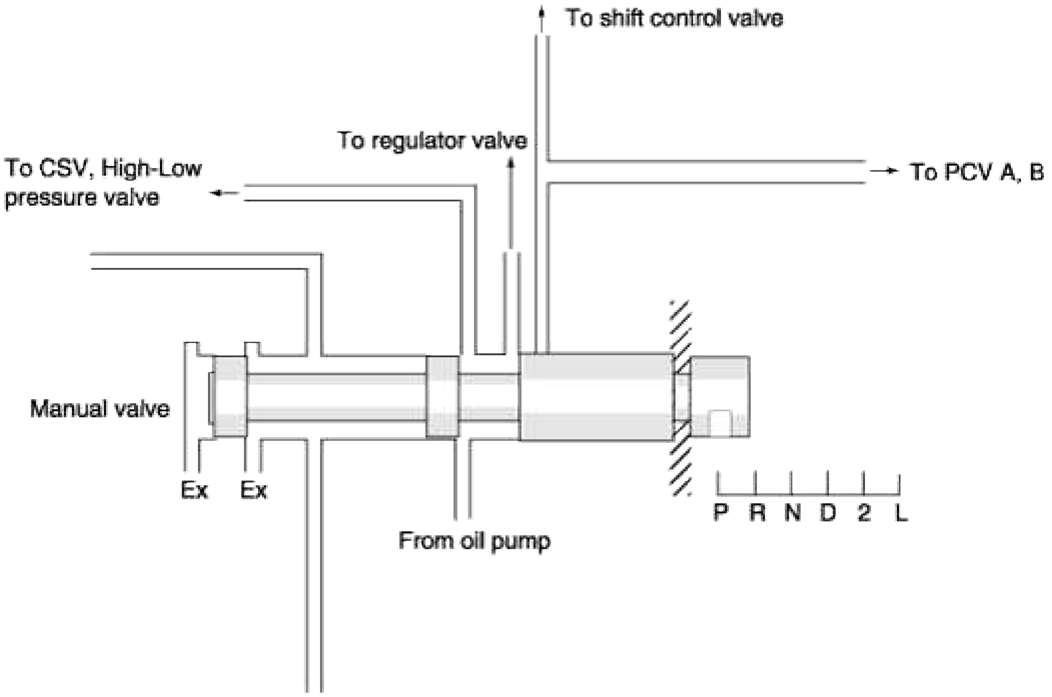

DAMPER CLUTCH
TORQUE CONVERTER
DAMPER CLUTCH CONTROL SOLENOID VALVE
TCU
OFF
EX
COOLER
TO LUB. (FRONT)
OIL FILTER
OIL PAN
OIL PUMP
T/C CONTROL VALVE
REGULATOR VALVE
DAMPER CLUTCH CONTROL VALVE
TO LUB. (REAR)
LINE RELIEF VALVE
REDUCING VALVE
REAR CLUTCH EXHAUST VALVE
MANUAL VALVE
SHIFT CONTROL SOLENOID VALVE "B"
SHIFT CONTROL VALVE
SHIFT CONTROL SOLENOID VALVE "A"
REAR CLUTCH
ACCUMULATOR
N-R CONTROL VALVE
P R N D 2 L
2-3 & 4-3 SHIFT VALVE
END CLUTCH
PRESSURE CONTROL VALVE "A"
PRESSURE CONTROL SOLENOID VALVE "B"
PRESSURE CONTROL SOLENOID VALVE "A"
KICK DOWN SERVO
L&R VALVE
1-2 SHIFT VALVE
END CLUTCH VALVE
FAIL SAFE VALVE
CONTROL SWITCH VALVE
SHIFT CONTROL SOLENOID VALVE "C"
HIGH-LOW PRESSURE VALVE
LINE PRESSURE
TORQJE CONVERTER AND LUBRICATION PRESSURE
REDUCING PRESSURE

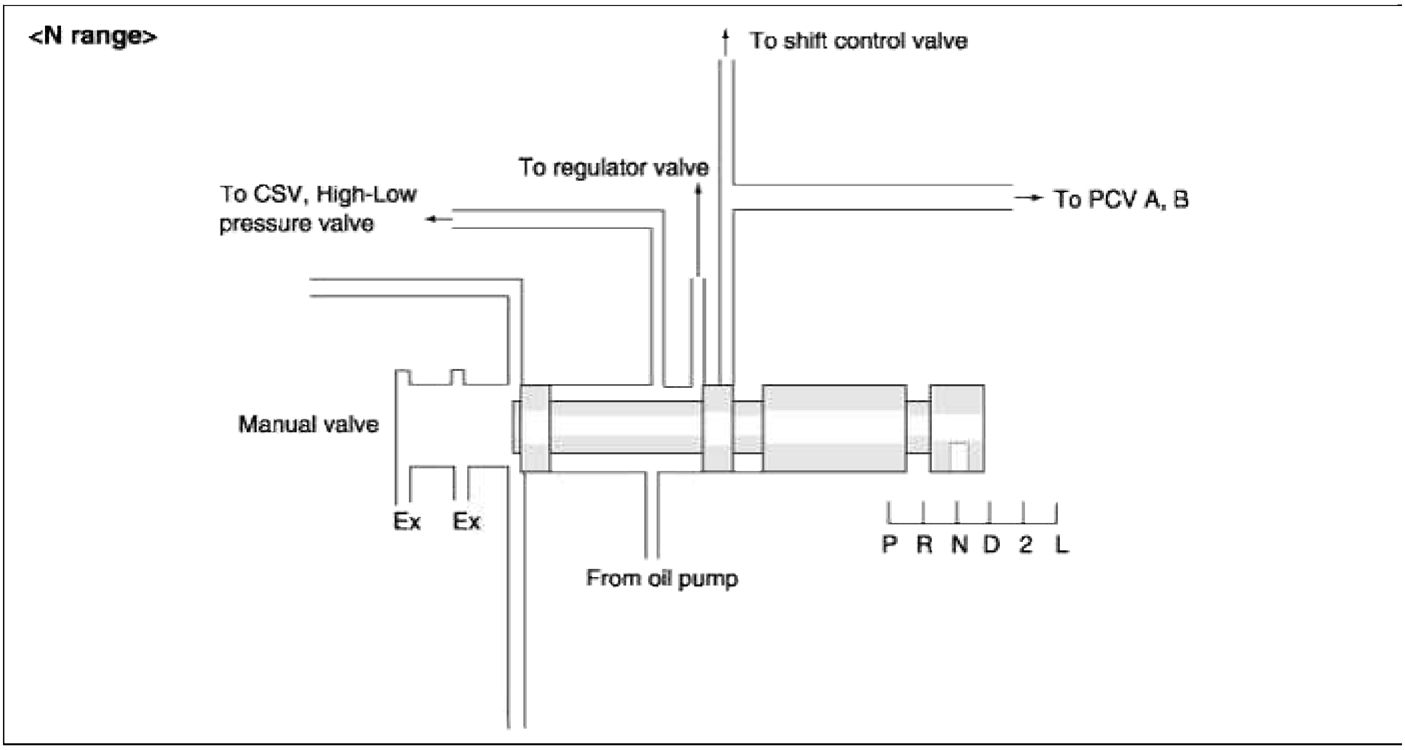
HYDRAULIC CONTROL SYSTEM
MANUAL VALVE

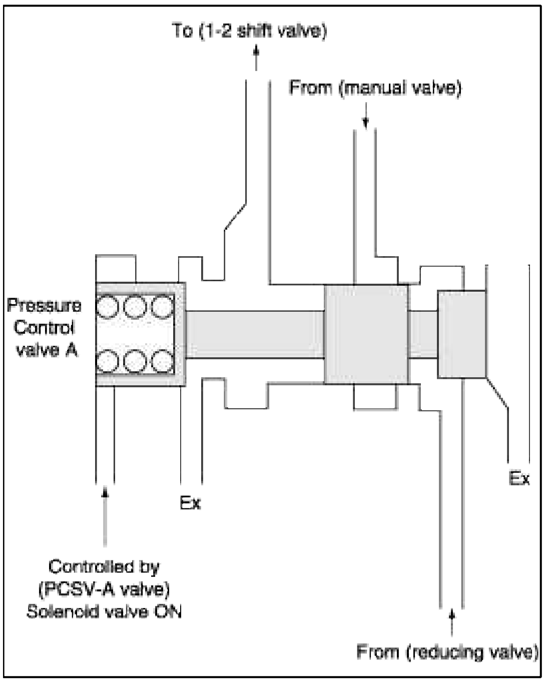
<D range>

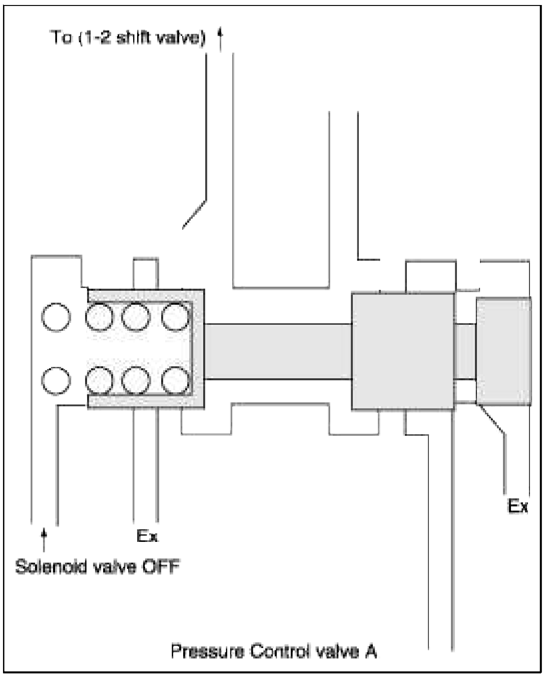

To torque converter
To shift control valve
Regulator valve
Ex
To pressure control valve
Manual valve
Oil pump
Ex Ex
P R N D 2 L
Oil filter
Oil fan
Ex
To N-R control valve

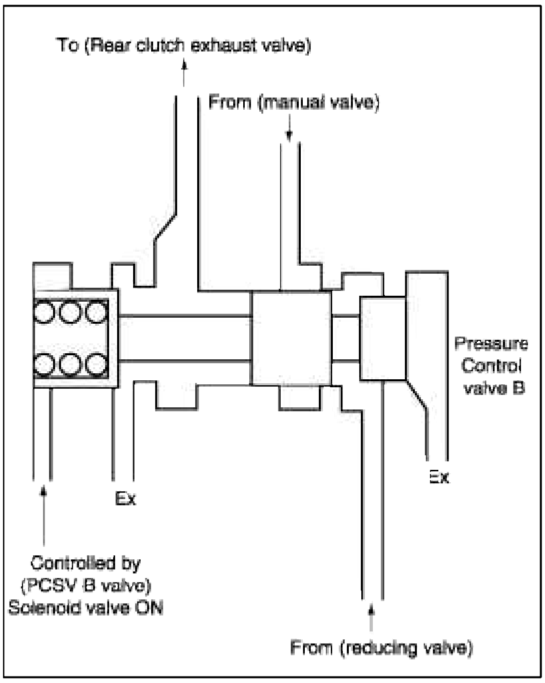
<P range>

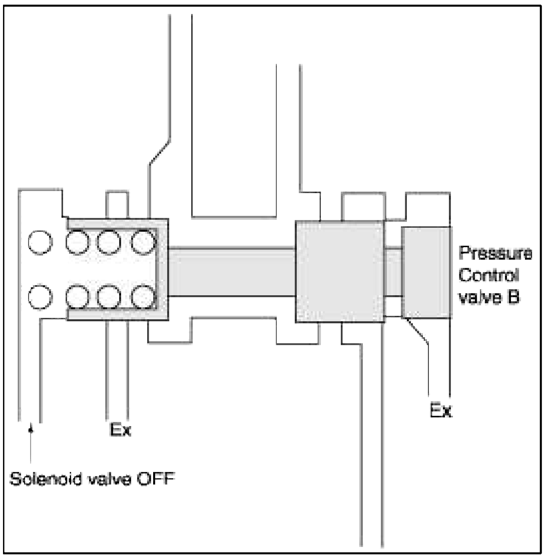

To shift control valve
To regulator valve
To CSV, High-Low pressure valve
To PCV A, B
Manual valve
Ex Ex
From oil pump
P R N D 2 L


<N range>
To shift control valve
To regulator valve
To CSV, High-Low pressure valve
To PCV A, B
Manual valve
Ex
Ex
P R N D 2 L
From oil pump


To (1-2 shift valve)
From (manual valve)
Pressure Control valve A
Ex
Ex
Controlled by (PCSV-A valve) Solenoid valve ON
From (reducing valve)


To (1-2 shift valve)
Ex
Ex
Solenoid valve OFF
Pressure Control valve A


To (Rear clutch exhaust valve)
From (manual valve)
Pressure Control valve B
Ex
Ex
Controlled by (PCSV B valve) Solenoid valve ON
From (reducing valve)

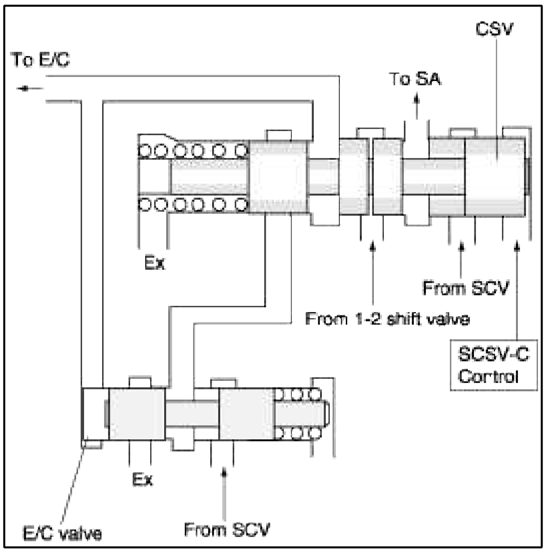

Pressure Control valve B
Ex
Ex
Solenoid valve OFF

Operation	**Shift control solenoid valve**		
Position	**A**	**B**	**C**
1st gear	ON	ON	OFF
2nd gear	OFF	ON	OFF
3rd gear	OFF	OFF	ON
4th gear	ON	OFF	ON

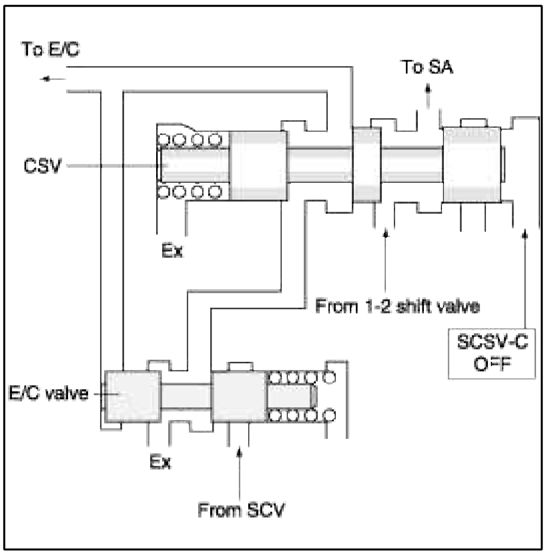
Items	**A4AF2**	**A4AF3**
Pressure Control for SA, E/C	PCV + PCSV PCV N-D V/v 1-2Shift V/v	PCV-A + PCSV-A PCV-A, 1-2Shift V/v
Pressure Control for R/C	PCV + PCSV PCV N-D V/v RCE V/v	PCV-B + Another Sol. V/v (PCSV-B) PCV-B, RCE V/v (with accumulator)

Changed points :

- N-D valve has been eliminated.
- PCSV-B has been added for Rear clutch pressure control independently.
- Mechanical accumulator has been adopted.
- E/C release control : PCV-A, Switching of SA, E/C :CSV
- Function
  Switching the pressure of E/C and SA.


To E/C
CSV
To SA
Ex
From SCV
From 1-2 shift valve
SCSV-C Control
Ex
E/C valve
From SCV

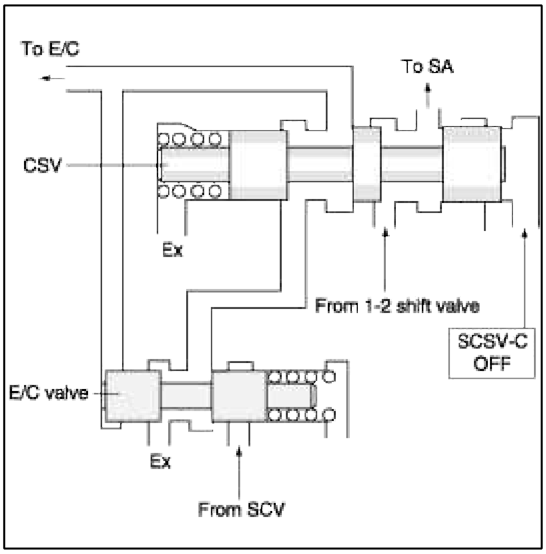
- 2nd. Gear


To E/C
To SA
CSV
Ex
From 1-2 shift valve
SCSV-C OFF
E/C valve
Ex
From SCV

- The 2nd. pressure is supplied to SA through CSV.
- SCSV-C is OFF as well as 1st. gear.

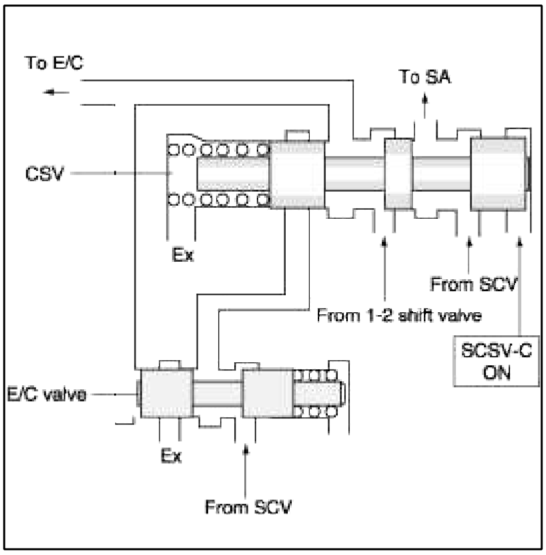
- 2nd.→3rd. gear

- SCSV-C maintains OFF as well as 2nd gear.
- The E/C pressure from shift control valve is intercepted at the E/C valve during up-shifting from 2nd to 3rd gear.
- SA pressure is supplied from 1-2 shift valve, but the front clutch and SR pressure is also supplied from the 2-3/4-3 shift valve, so the both SR and SA pressure will be set off.


To E/C
To SA
CSV
Ex
From 1-2 shift valve
SCSV-C OFF
E/C valve
Ex
From SCV

- 3rd. gear

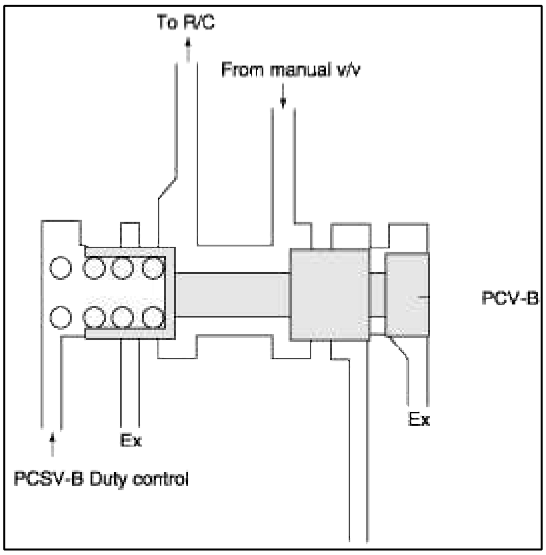
- SCSV-C is changed from OFF to ON.
- The E/C pressure is supplied from 1-2 shift valve at the CSV after finishing the up-shifting from 2nd to 3rd gear.
- SA pressure is supplied from shift control valve, but the front clutch and SR pressure is also supplied from the 2-3/4-3 shift valve, so the both SR and SA pressure will be set off.


To E/C
To SA
CSV
Ex
From SCV
From 1-2 shift valve
SCSV-C ON
E/C valve
Ex
From SCV

1. Operating elements

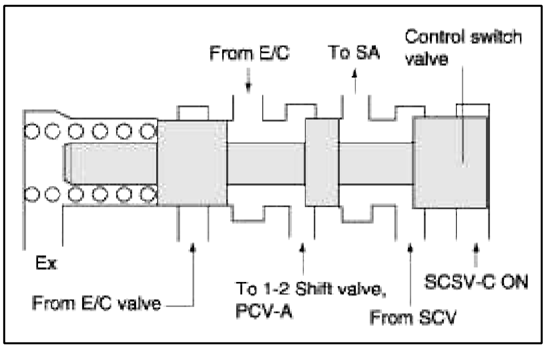
Speed	R/C	E/C	K/D
4th.	-	O	O
2nd.	O	-	O

2. Controls
   A. R/C engaging duty control
   B. E/C releasing duty control
   C. Continuous switching to SA
3. Description
   A. R/C engaging duty control


To R/C
From manual v/v
PCV-B
Ex
Ex
PCSV-B Duty control

B. E/C releasing duty control

4→2 Skip shift only (SCSV-C ON)


From E/C
To SA
Control switch valve
Ex
From E/C valve
To 1-2 Shift valve, PCV-A
From SCV
SCSV-C ON

When releasing the E/C clutch pressure, it is controlled by duty of PCSV-A only in case of 4→2 skip shift.

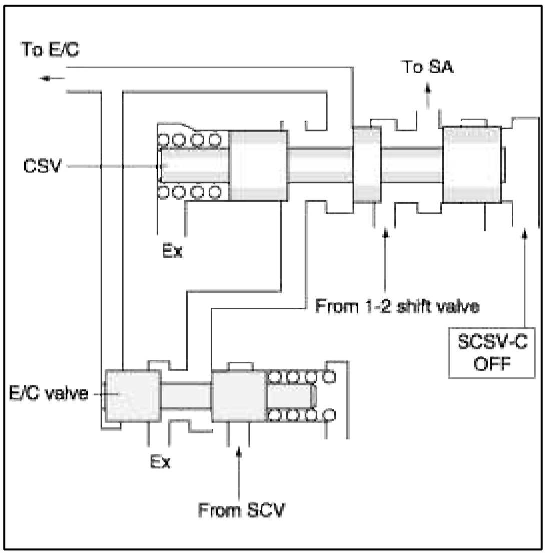
C. Continuous switching to SA

- From (SCV) to SA through (CSV)

1. TCM fail when drive with 1st or 2nd speed.

Speed	F/C	R/C	E/C	K/D
1st.		O		
2nd.		O		O
Fail	O	O		

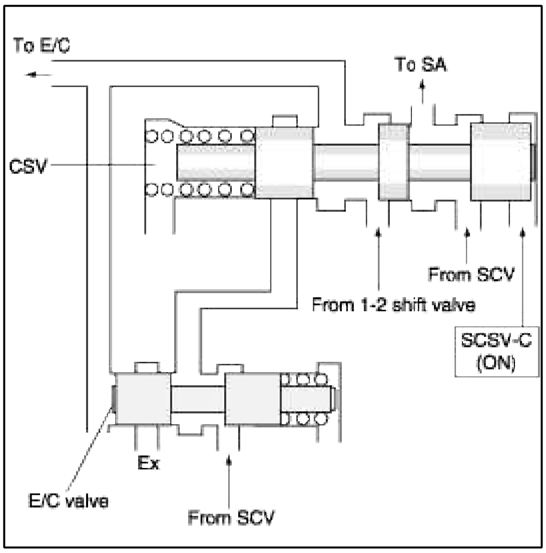
- F/C, SR : from 2-3/4-3 shift valve
- R/C : from PCV-B
- SA : from 1-2 shift valve


To E/C
To SA
CSV
Ex
From 1-2 shift valve
SCSV-C OFF
E/C valve
Ex
From SCV

2. TCM fail when drive with 1st or 2nd speed.

Speed	F/C	R/C	E/C	K/D
1st.		O		
2nd.		O		O
Fail		O	O	O

- R/C, E/C, SA : Interlock


To E/C
To SA
CSV
From SCV
From 1-2 shift valve
SCSV-C
(ON)
Ex
E/C valve
From SCV

NOTE

- SA : Servo Apply pressure
- F/C : Front Clutch pressure
- R/C : Rear Clutch pressure
- K/D : Kick Down
- SCV : Shift Control Valve
- CSV : Control Switch Valve
- PCSV : Pressure Control Solenoid Valve
- SCSV : Shift Control Solenoid Valve
- PCV : Pressure Control Valve
- RCEV : Rear Clutch Exhaust Valve

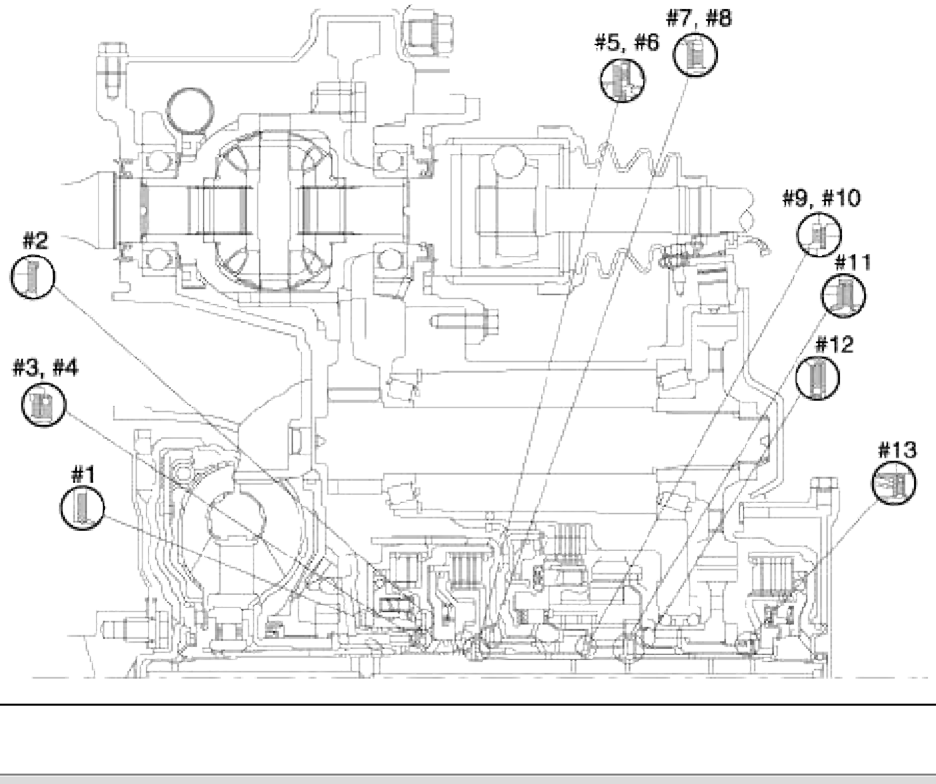
Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > General Information

GENERAL INFORMATION (A4AF3)

Automatic transaxle overhaul section has been separated from the shop manual.
A4AF3 overhaul section was included in the overhaul manual.

SELECTION OF SHIM

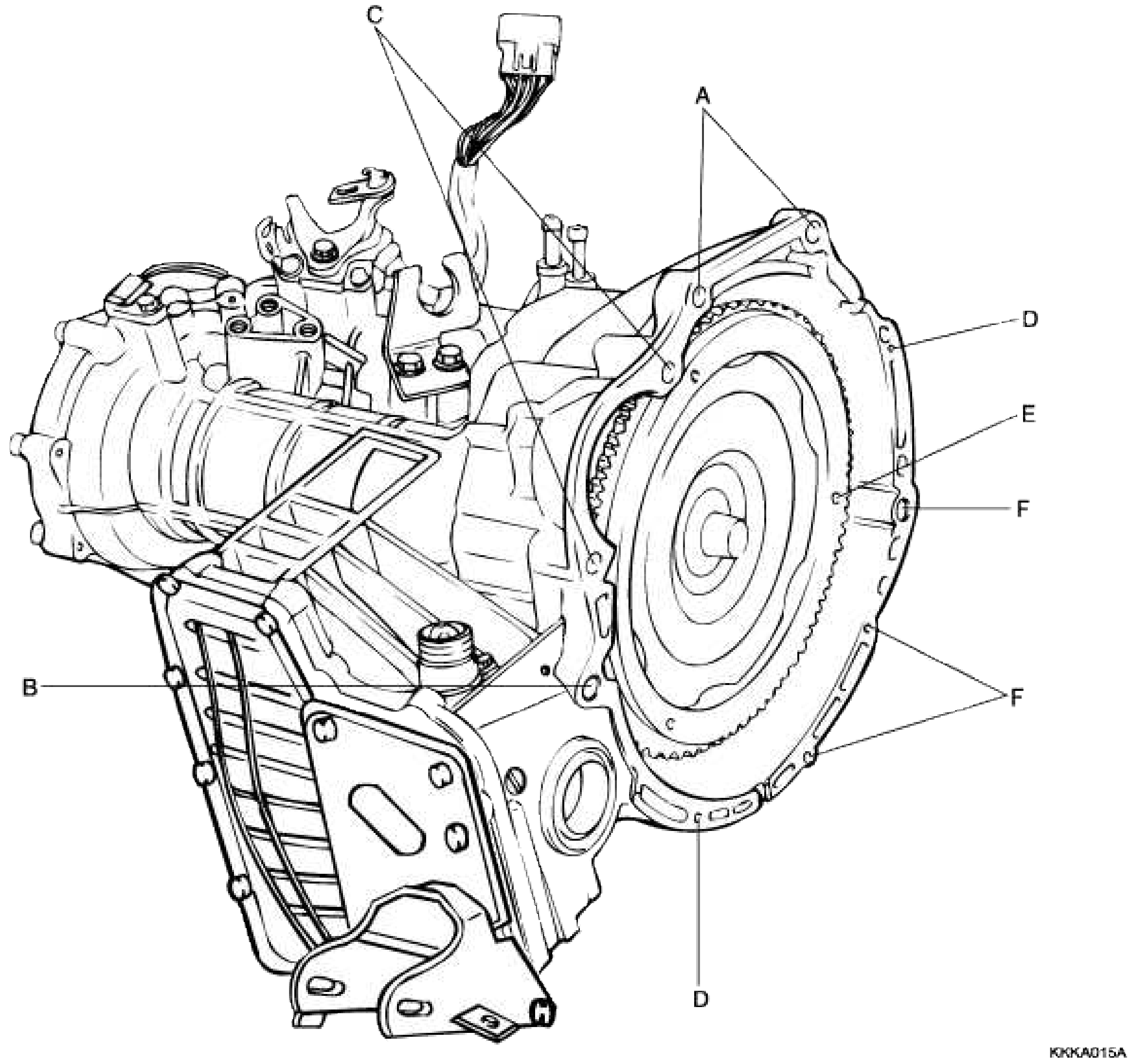
O.D	I.D	Thickness	Code No.	O.D	I.D	Thickness	Code No.
70	55.7	1.4	#1	48.1	34.4	-	#4
70	55.7	1.8		40	21	2.4	#5
70	55.7	2.2		42.6	28	2.5	#6
70	55.7	2.6		54	38.7	1.6	#7
70	55.7	1.8	#2	52	36.4	2.8	#8
48.9	37	1.0	#3	41	28	2.0	#9
48.9	37	1.2		39	28	1.2	#10
48.9	37	1.4		38	22.2	-	#11
48.9	37	1.6		52	36.4	2.8	#12
48.9	37	1.8		58	44	5.0	#13
48.9	37	2.0					
48.9	37	2.2					
48.9	37	2.4					
							Unit : mm



Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > Components and Components Location

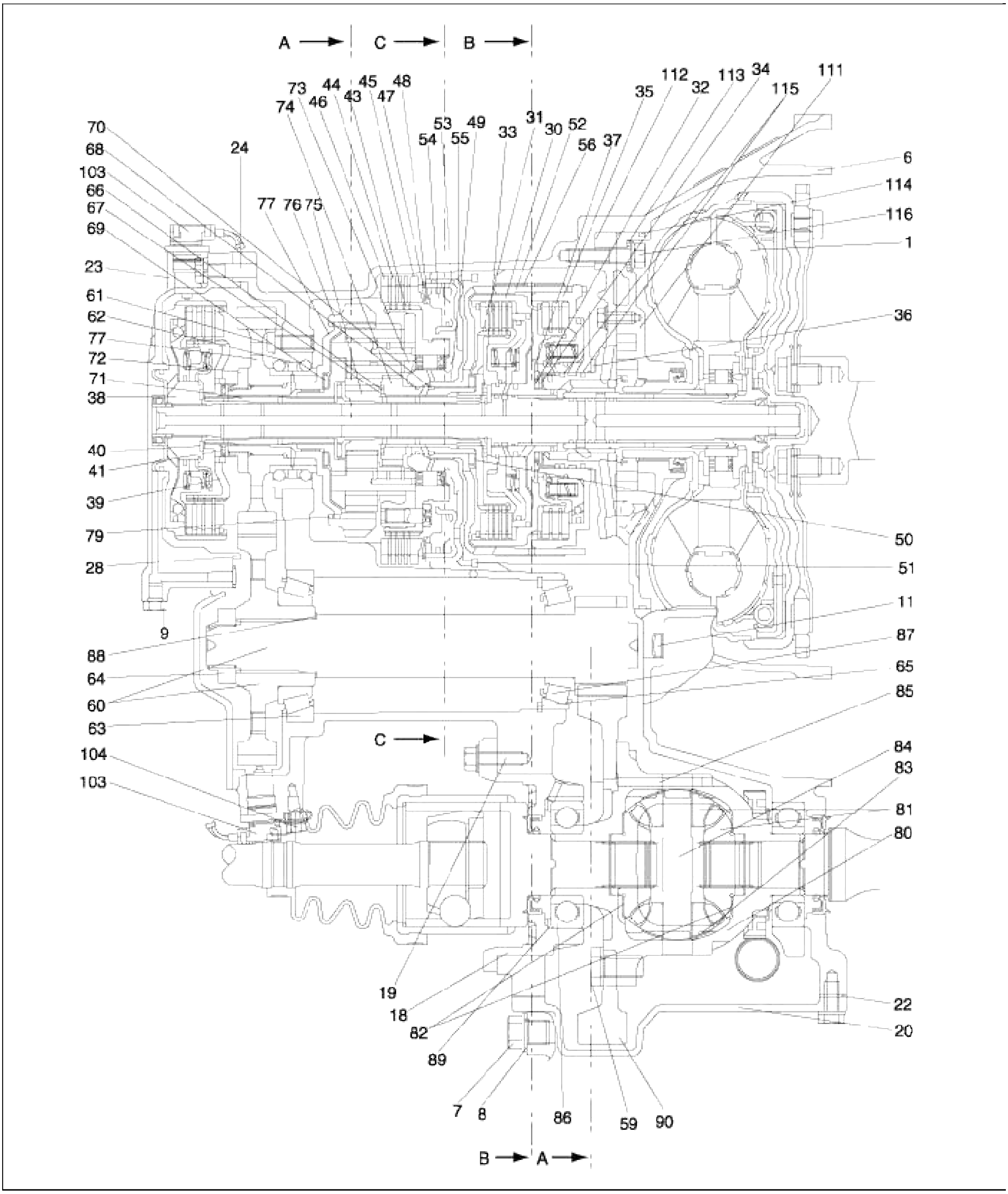
AUTOMATIC TRANSAXLE

COMPONENTS

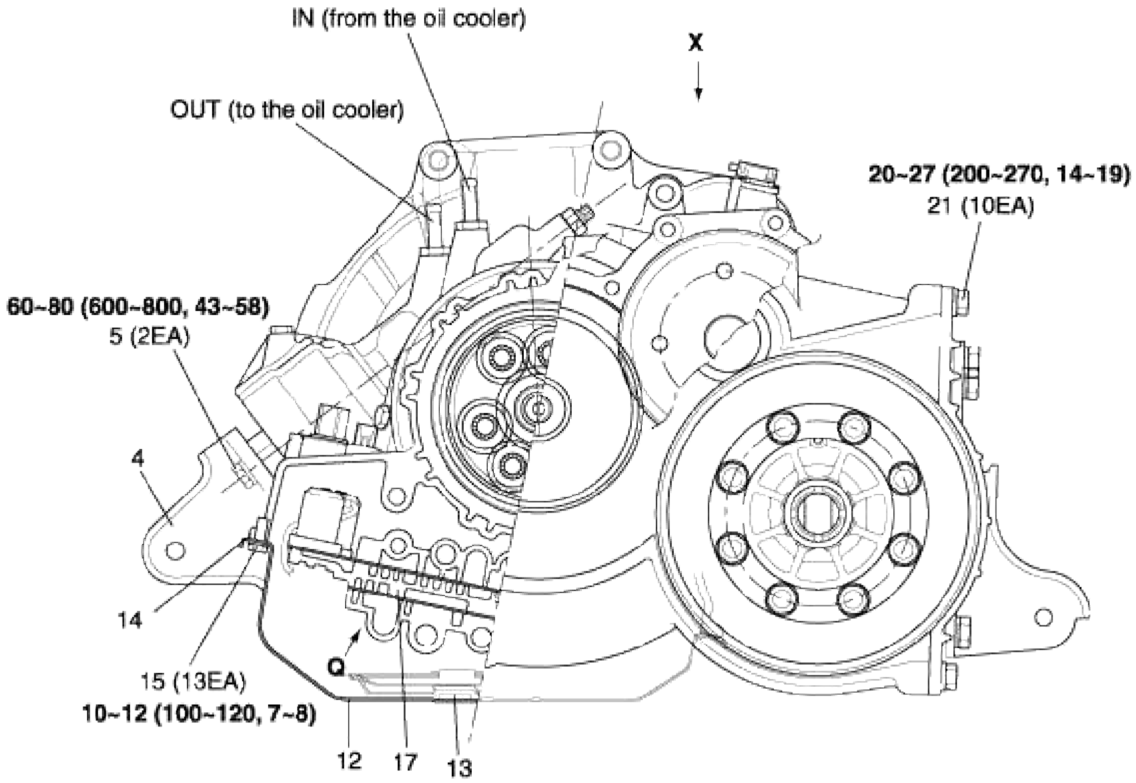


	Torque (kg·m)	O.D x Length (mm)	Identification Mark
A	6~8	$\boxed{7}$ 12x40	$\boxed{7}$ AxB
B	4.3~5.5	$\boxed{7}$ 10x70	
C	2.7~3.4	$\boxed{7}$ 10x55	
D	0.8~1.0	$\boxed{7}$ 6x10	
E	4.6~5.3	$\boxed{7}$ 10x11	

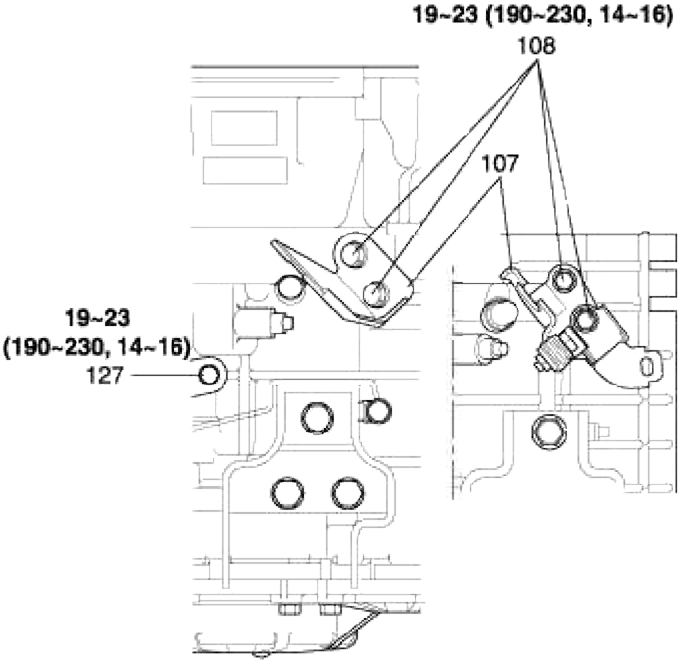
COMPONENTS (1)


A
C
B
70
68
103
66
67
69
23
61
62
77
72
71
38
40
41
39
79
28
9
88
64
60
63
104
103
24
77 76 75
73 74 44 46 43 45 47 48
53 54 55 49
33
31 30 52
56 37
35 112 32 113 34 115 111
6
114
116
1
36
50
51
11
87
65
85
84
83
81
80
22
20
C
19
18
82
89
7
8
86
59
90
B
A

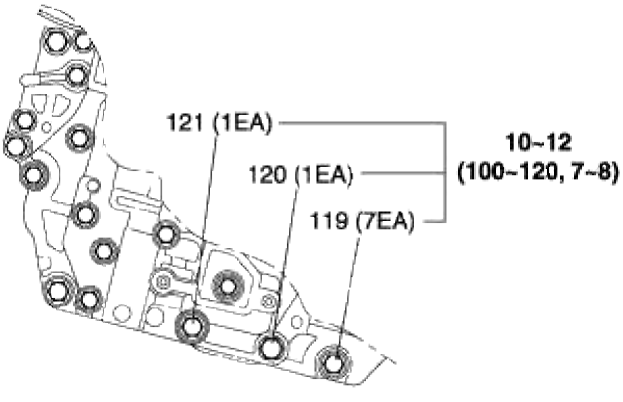
COMPONENTS (2)


IN (from the oil cooler)
X
OUT (to the oil cooler)
20~27 (200~270, 14~19)
21 (10EA)
60~80 (600~800, 43~58)
5 (2EA)
4
14
Q
15 (13EA)
10~12 (100~120, 7~8)
12
17
13

<Section A-A>


19~23 (190~230, 14~16)
108
107
19~23
(190~230, 14~16)
127

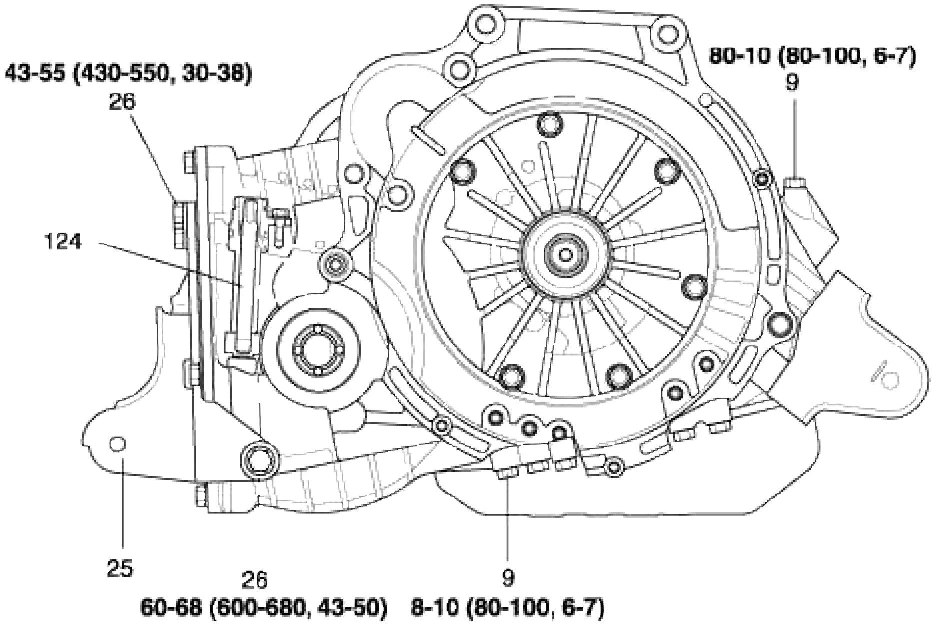
<VIEW 'X'>


121 (1EA)
120 (1EA)
119 (7EA)
10~12
(100~120, 7~8)

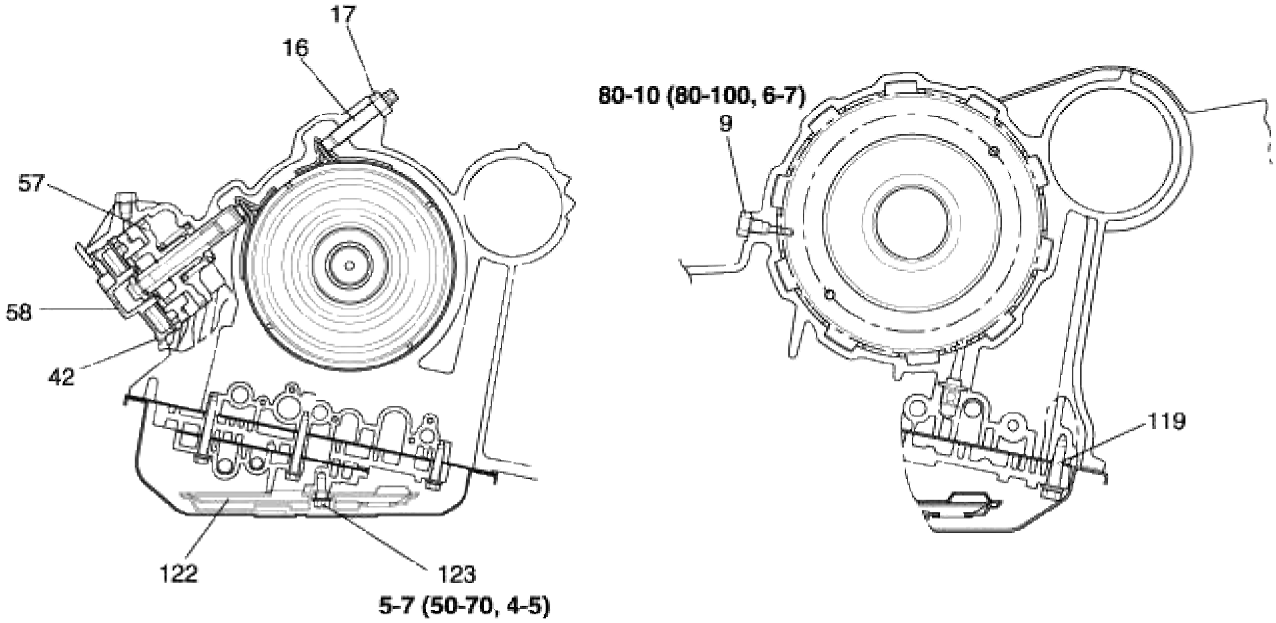
<VIEW 'Q'>

TORQUE : N·m (kg·cm, lb·ft)

COMPONENTS (3)


43-55 (430-550, 30-38)
26
124
80-10 (80-100, 6-7)
9
25
26
60-68 (600-680, 43-50)
9
8-10 (80-100, 6-7)

<Front view>

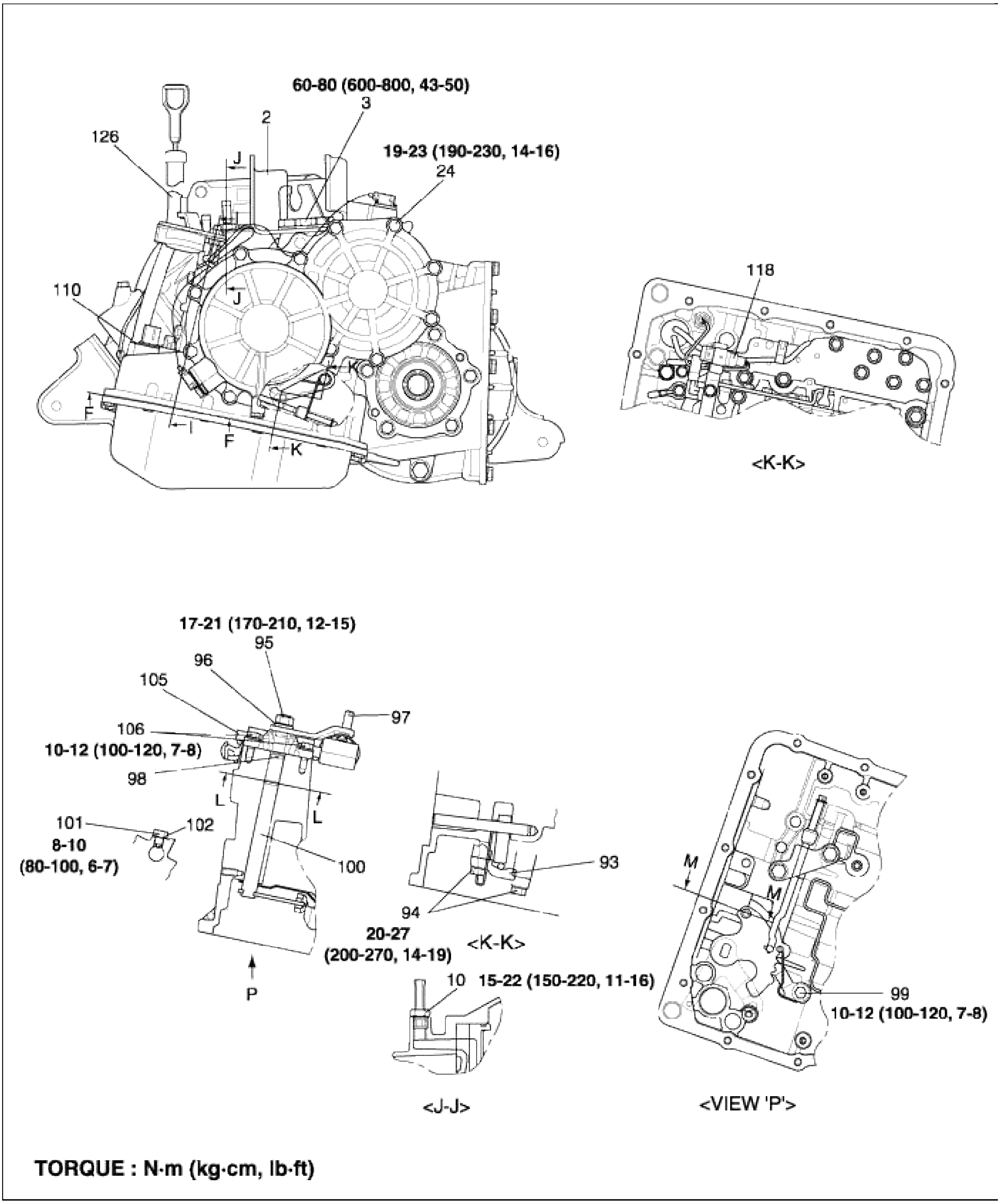

17
16
57
58
42
122
123
5-7 (50-70, 4-5)
80-10 (80-100, 6-7)
9
119

<Section B-B>

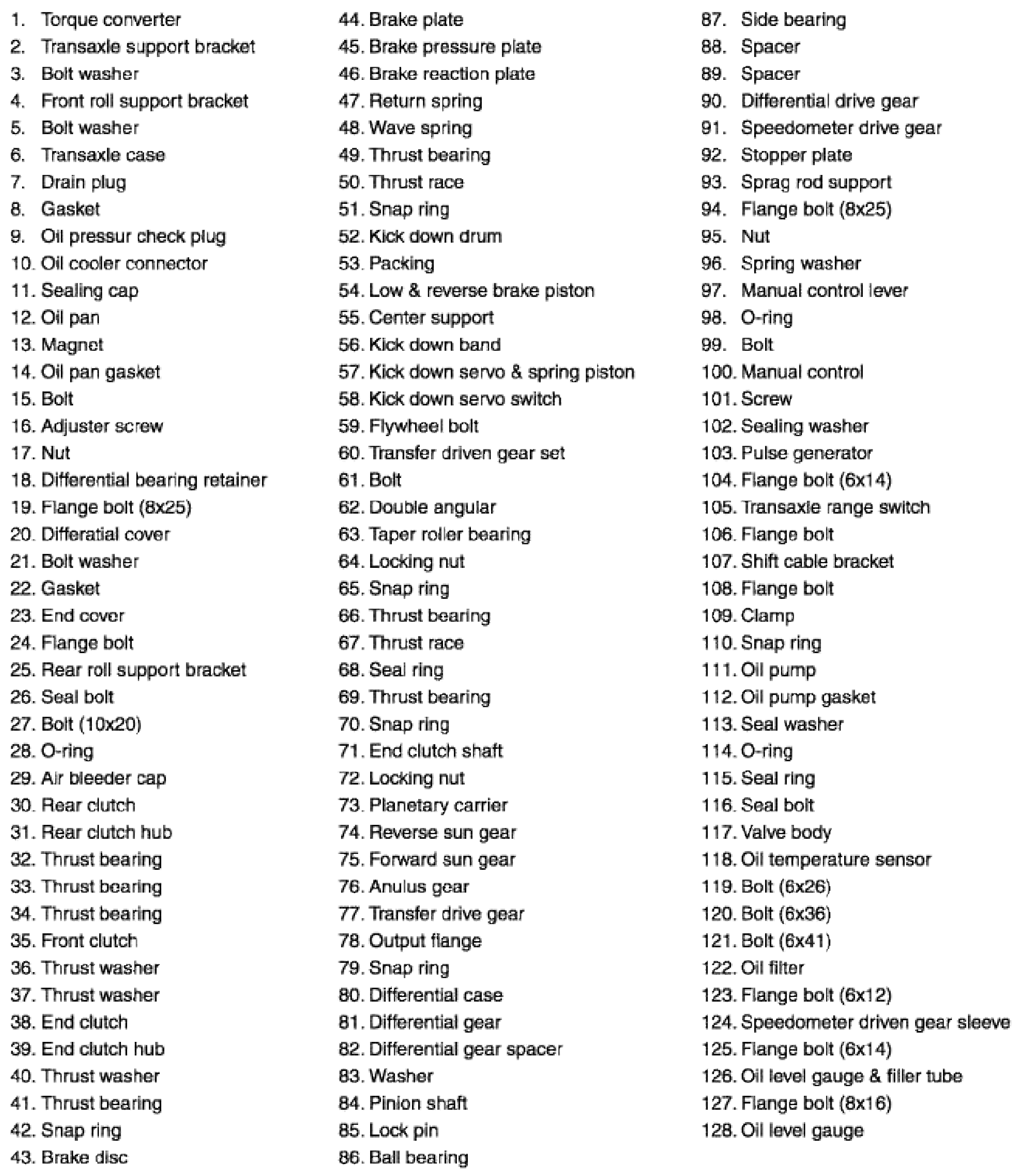
<Section C-C>

TORQUE : N·m (kg·cm, lb·ft)

COMPONENTS (4)


60-80 (600-800, 43-50)
3
2
126
J
19-23 (190-230, 14-16)
24
J
110
K
F
I
F
K
118
<K-K>
17-21 (170-210, 12-15)
95
96
105
106
10-12 (100-120, 7-8)
97
98
L
L
101
102
8-10
(80-100, 6-7)
100
93
94
20-27
(200-270, 14-19)
<K-K>
P
10
15-22 (150-220, 11-16)
<J-J>
M
M
99
10-12 (100-120, 7-8)
<VIEW 'P'>
TORQUE : N·m (kg·cm, lb·ft)

COMPONENTS (5)

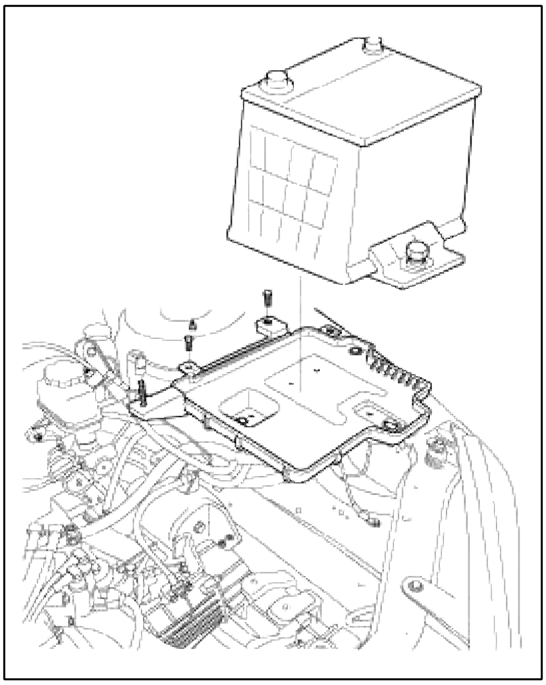


1. Torque converter
2. Transaxle support bracket
3. Bolt washer
4. Front roll support bracket
5. Bolt washer
6. Transaxle case
7. Drain plug
8. Gasket
9. Oil pressur check plug
10. Oil cooler connector
11. Sealing cap
12. Oil pan
13. Magnet
14. Oil pan gasket
15. Bolt
16. Adjuster screw
17. Nut
18. Differential bearing retainer
19. Flange bolt (8x25)
20. Differatial cover
21. Bolt washer
22. Gasket
23. End cover
24. Flange bolt
25. Rear roll support bracket
26. Seal bolt
27. Bolt (10x20)
28. O-ring
29. Air bleeder cap
30. Rear clutch
31. Rear clutch hub
32. Thrust bearing
33. Thrust bearing
34. Thrust bearing
35. Front clutch
36. Thrust washer
37. Thrust washer
38. End clutch
39. End clutch hub
40. Thrust washer
41. Thrust bearing
42. Snap ring
43. Brake disc
44. Brake plate
45. Brake pressure plate
46. Brake reaction plate
47. Return spring
48. Wave spring
49. Thrust bearing
50. Thrust race
51. Snap ring
52. Kick down drum
53. Packing
54. Low & reverse brake piston
55. Center support
56. Kick down band
57. Kick down servo & spring piston
58. Kick down servo switch
59. Flywheel bolt
60. Transfer driven gear set
61. Bolt
62. Double angular
63. Taper roller bearing
64. Locking nut
65. Snap ring
66. Thrust bearing
67. Thrust race
68. Seal ring
69. Thrust bearing
70. Snap ring
71. End clutch shaft
72. Locking nut
73. Planetary carrier
74. Reverse sun gear
75. Forward sun gear
76. Anulus gear
77. Transfer drive gear
78. Output flange
79. Snap ring
80. Differential case
81. Differential gear
82. Differential gear spacer
83. Washer
84. Pinion shaft
85. Lock pin
86. Ball bearing
87. Side bearing
88. Spacer
89. Spacer
90. Differential drive gear
91. Speedometer drive gear
92. Stopper plate
93. Sprag rod support
94. Flange bolt (8x25)
95. Nut
96. Spring washer
97. Manual control lever
98. O-ring
99. Bolt
100. Manual control
101. Screw
102. Sealing washer
103. Pulse generator
104. Flange bolt (6x14)
105. Transaxle range switch
106. Flange bolt
107. Shift cable bracket
108. Flange bolt
109. Clamp
110. Snap ring
111. Oil pump
112. Oil pump gasket
113. Seal washer
114. O-ring
115. Seal ring
116. Seal bolt
117. Valve body
118. Oil temperature sensor
119. Bolt (6x26)
120. Bolt (6x36)
121. Bolt (6x41)
122. Oil filter
123. Flange bolt (6x12)
124. Speedometer driven gear sleeve
125. Flange bolt (6x14)
126. Oil level gauge & filler tube
127. Flange bolt (8x16)
128. Oil level gauge

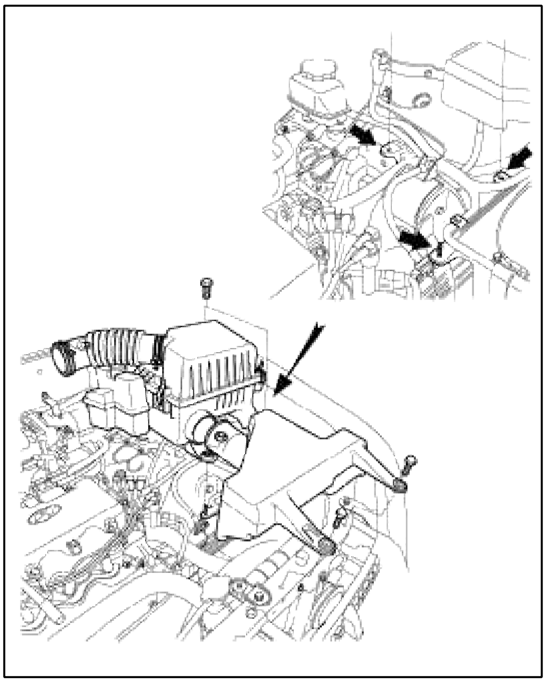
Automatic Transaxle System > Automatic Transaxle System > Automatic Transaxle > Repair procedures

REMOVAL

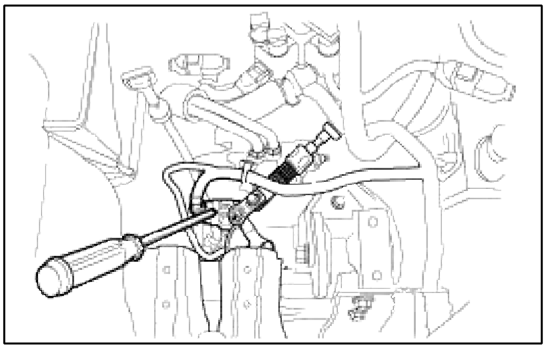
1. Remove the battery terminal and the battery.



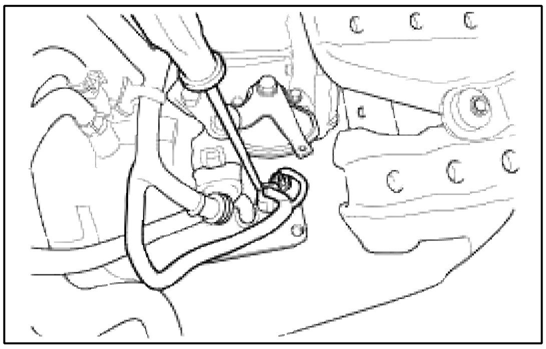
2. Removal the air cleaner.



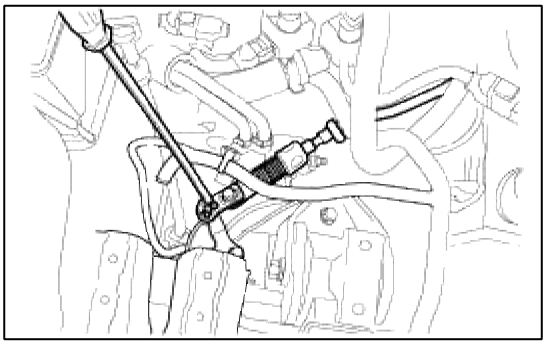
3. Remove the transaxle range switch connector.



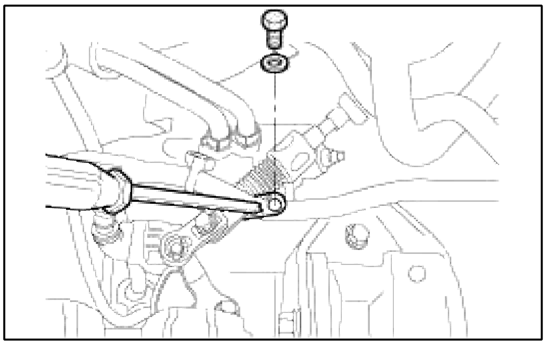
4. Remove the solenoid valve connector and the oil temperature sensor connector.



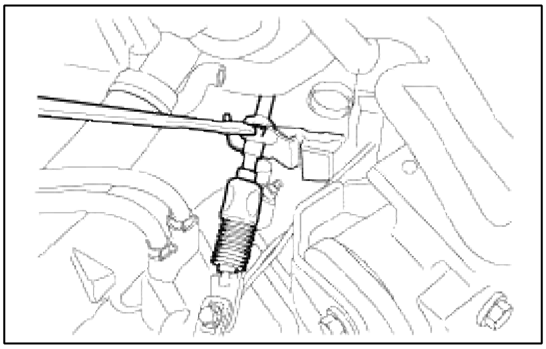
5. Remove the cotter pin of the control cable.



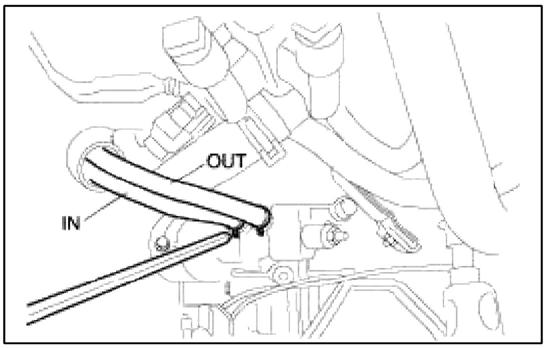
6. Remove the oil filler tube.



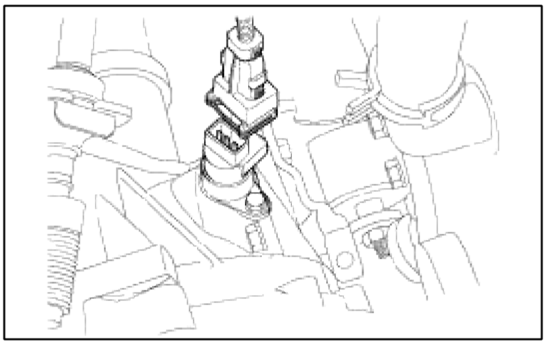
7. Remove the clip of the control cable.



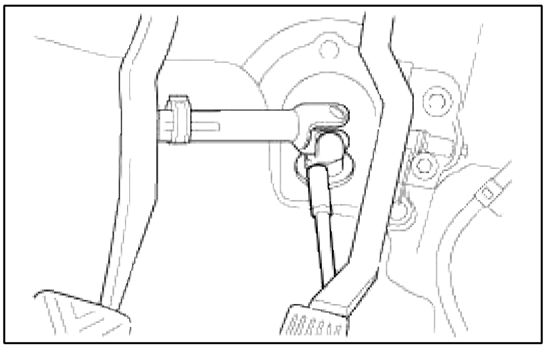
8. Remove the oil cooler hose.



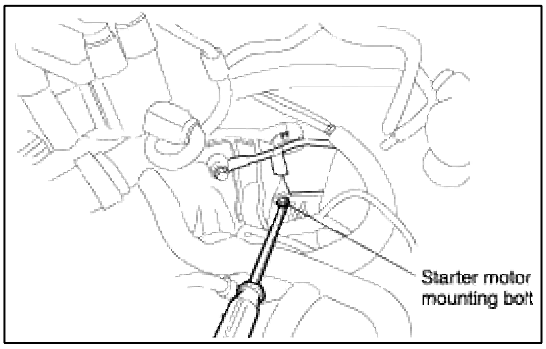
9. Remove the speedometer driven gear connector.
   (speed sensor connector)



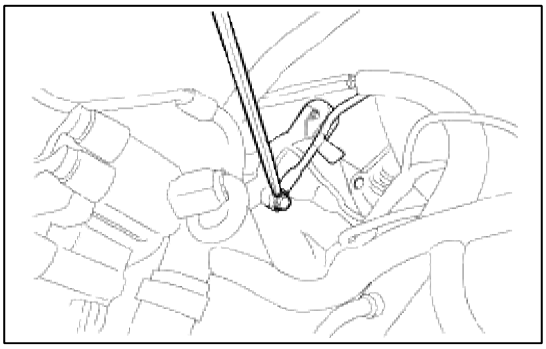
10. Remove the u-joint.



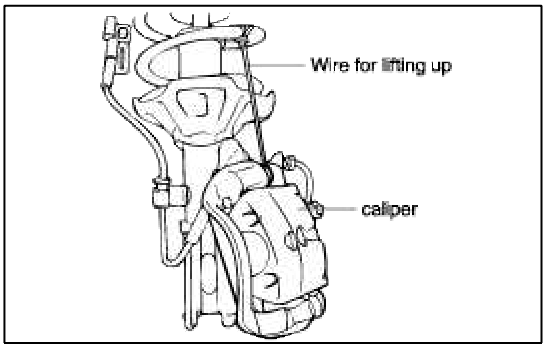
11. Remove the power steering return hose.
12. Remove the tire.
13. Remove the starter motor.



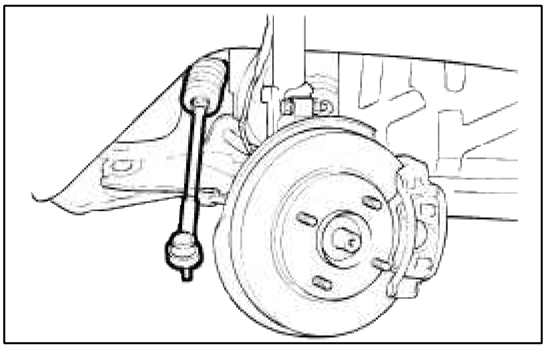
14. Remove the bolt for the upper connection of the engine and the transaxle.



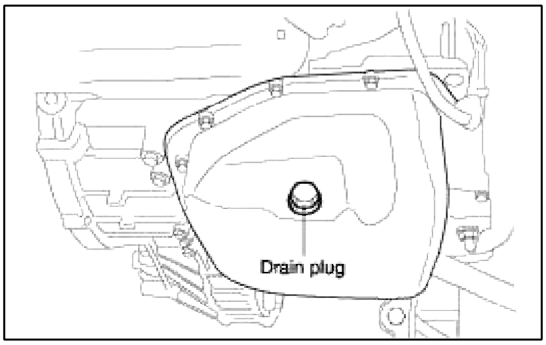
15. Remove the caliper after lifting up the vehicle.


Wire for lifting up
caliper

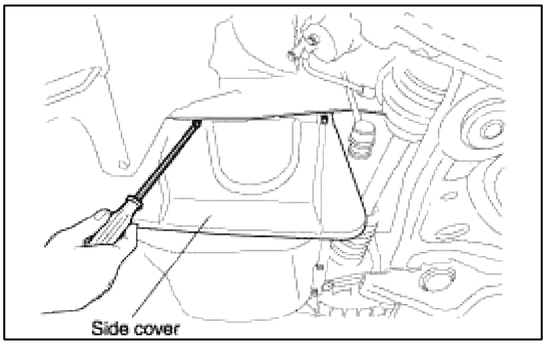
16. Separate the tie rod end from the pin and nut.



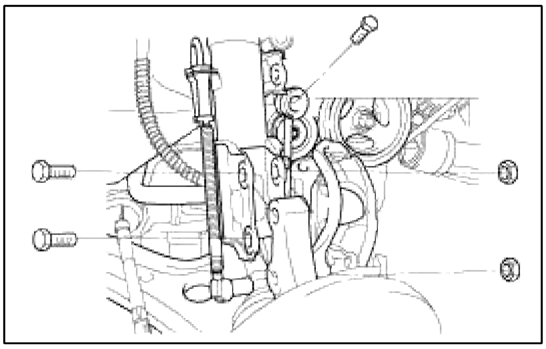
17. Remove the oil drain plug and drain the oil.



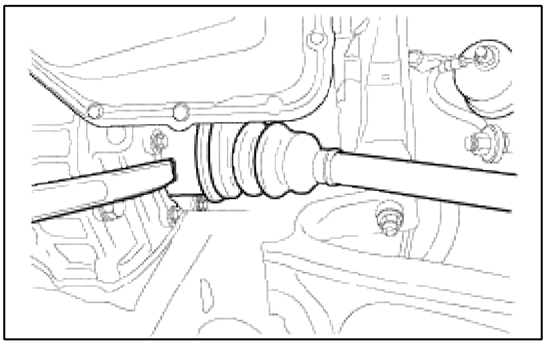
18. Remove the transaxle side cover.



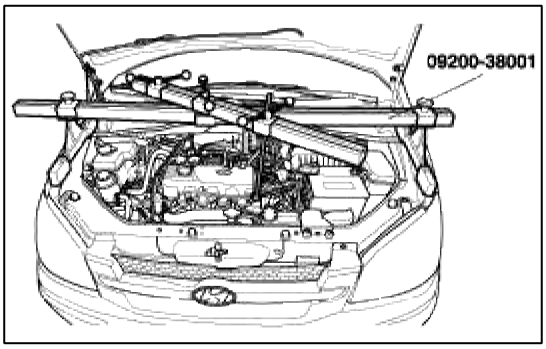
19. Remove the wheel speed sensor and the knuckle mounting bolt.



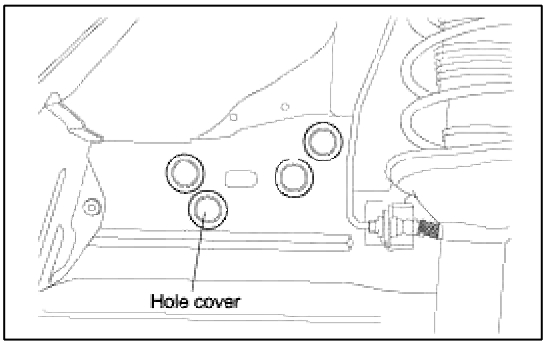
20. Remove the drive shaft and the left side hub nut.



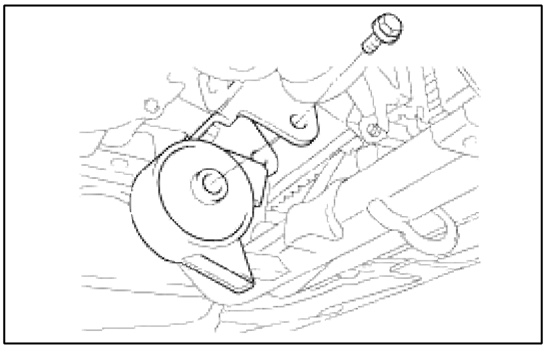
21. Install the special tool, the engine support fixture on the engine assembly.



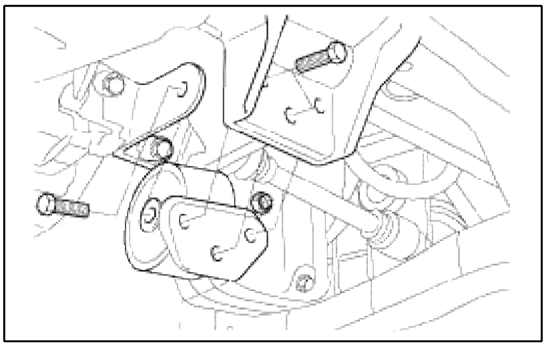
22. Remove the transaxle mounting bracket after removing the hole cover and the mounting bolts.



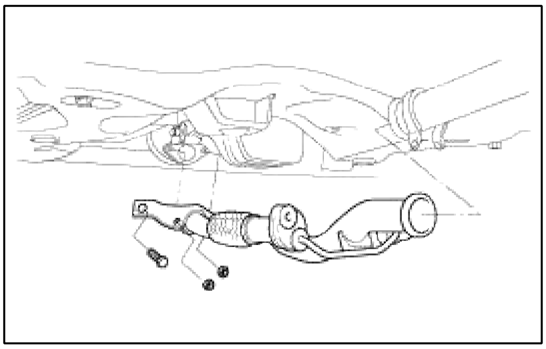
23. Remove the front roll stopper.



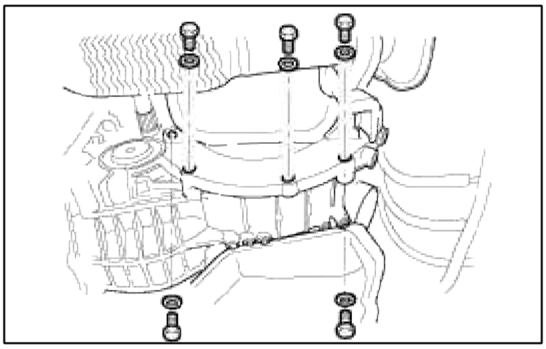
24. Remove the rear roll stopper.



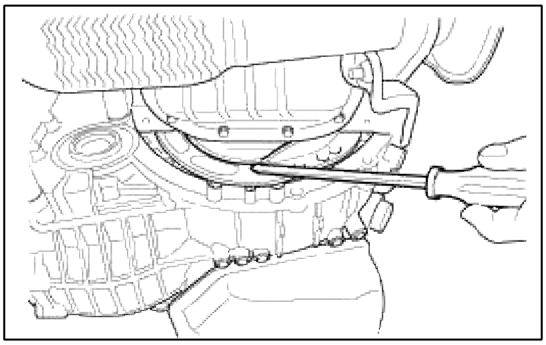
25. Remove the front muffler.



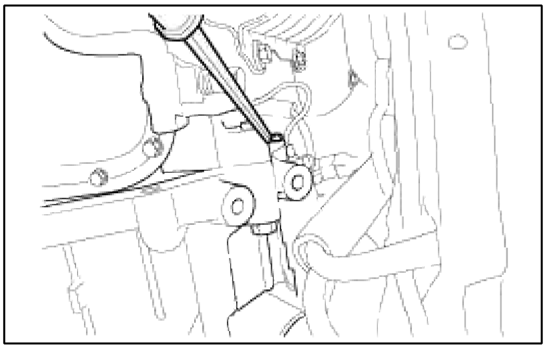
26. Remove the bell housing cover. (Bolts : 5EA)



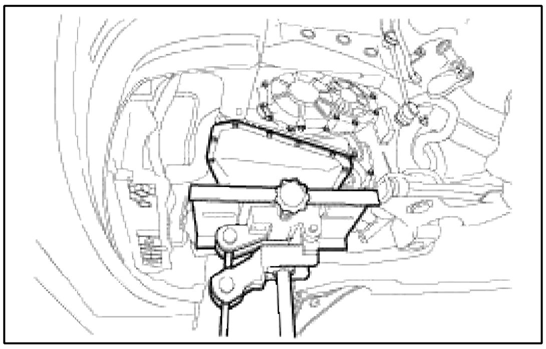
27. Remove the torque converter mounting plate bolts (3EA).



28. Remove the cylinder block plate bolt.

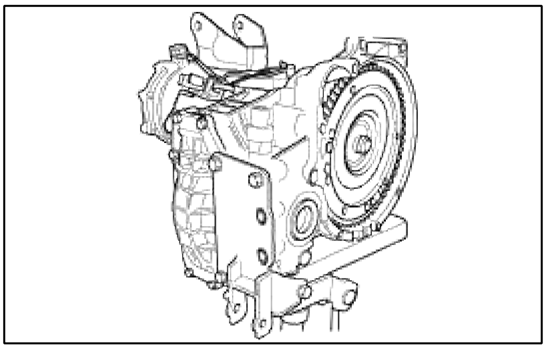


29. Install the jack for supporting transaxle.



30. Remove the lower mounting bolts (2EA) of the transaxle.
31. Remove the sub frame.

32. Remove the transaxle.



INSTALLATION

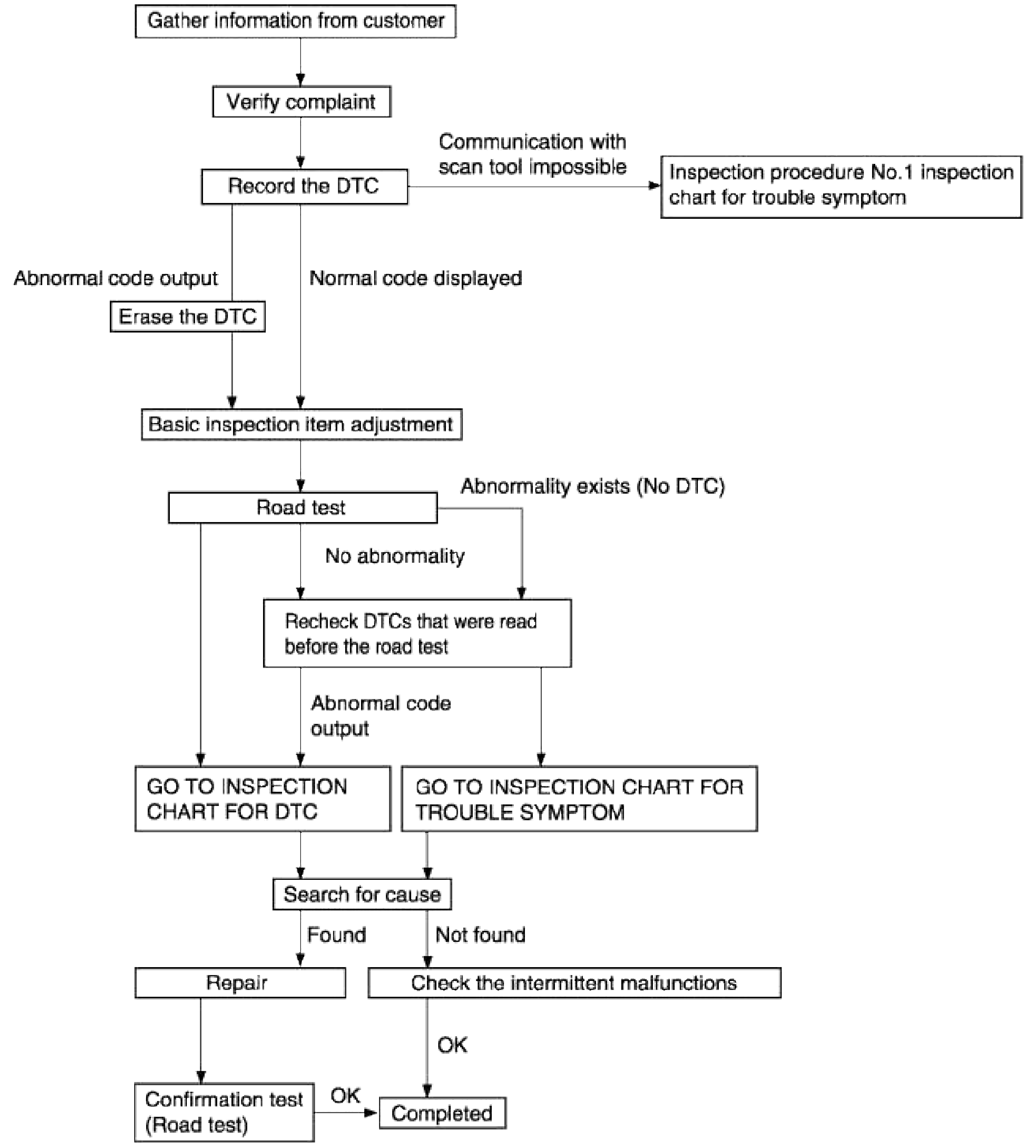
1. Attach the torque converter on the transaxle side and mount the transaxle assembly onto the engine.

> **CAUTION**
>
> - If the torque converter is mounted on the engine first, the oil seal on the transaxle side may be damaged. Therefore, be sure to first assemble the torque converter to the transaxle.
> - When installing the roll stopper mounting bracket, be careful not to crush the insulator. If crushed, idle vibration may occur.

2. Install the transaxle control cable and adjust as follows:
   - A. Move the shift lever and the transaxle range switch to the "N" position and install the control cable.
   - B. When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts to the control cable.
   - C. Remove any free-play in the control cable by adjusting the nut and then check to see that the selected lever moves smoothly.
   - D. Check to see that the control cable has been adjusted correctly.

Automatic Transaxle System > Automatic Transaxle System > Troubleshooting

TROUBLESHOOTING (A/T)


Gather information from customer
Verify complaint
Communication with scan tool impossible
Record the DTC
Inspection procedure No.1 inspection chart for trouble symptom
Abnormal code output
Normal code displayed
Erase the DTC
Basic inspection item adjustment
Abnormality exists (No DTC)
Road test
No abnormality
Recheck DTCs that were read before the road test
Abnormal code output
GO TO INSPECTION CHART FOR DTC
GO TO INSPECTION CHART FOR TROUBLE SYMPTOM
Search for cause
Found
Not found
Repair
Check the intermittent malfunctions
OK
Confirmation test (Road test)
OK
Completed

ROAD TEST

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure if there is an abnormality
1	Ignition switch:ON Engine stopped	Overdrive switch • ON • OFF	• OD • OD-OFF	Overdrive switch	Overdrive switch system
2	Engine: Stopped	Starting test with lever in P or N range	Starting should be possible	Starting possible or impossible	Starting impossible (will not crank)

3	Warming up	Drive for 15 minutes or more so that the automatic transmission fluid temperature 70~110°C	Gradually rises to 70~110°C	Oil temperature sensor	Codes - P0712, P0713 Oil temperature sensor system
4	Engine:Idling Selector lever:N	Accelerator pedal • Fully closed • Depressed • Fully open (for at least 2 seconds)	• 2~18% • Gradually rises from (1) • 80 ~ 100%	TPS	TPS system
		Selector lever operation • N→D shift • N→D shift	Should be no abnormal shifting shocks. Time lag should be within 2 seconds.	Malfunction when starting	Engine stalling during shifting
					Shocks when changing from N to D and long lag time
					Shocks when changing from N to R and long lag time
					Shocks when changing from N to D, N to R and long lag time
	Engine:Idling (Vehicle stopped) Selector lever position:D	Selector lever operation • N→D • N→R shift	Should be no abnormal shifting shocks. Time lag should be within 2 seconds.	Driving impossible	Does not move forward
					Does not move (forward or reverse)
5	Engine:Idling (Vehicle stopped) Selector lever position:D	Accelerator pedal • Fully closed • Depressed [Driving at 5km/h (3.1 mph)]	• 75~90% • 100%	Pressure control solenoid valve (PCSV) - A, B	Code P0745, P0775 - Pressure control solenoid valve system
		Accelerator pedal • Fully closed • Depressed	• C • 1	Shift control solenoid valve A (SCSV-A)	Code P0750 - Shift control solenoid valve A system
					Code P0755 - Shift control solenoid valve B system
					Code P0760 - Shift control solenoid valve C system
	Selector lever position:D	Engine • Idling (vehicle	• C • 1	Shift control solenoid	Code P0750 - Shift control solenoid valve A

6	Overdrive:OFF	stopped) • Driving at 10km/h • Driving at constant speed of 50km/h (31mph) (20 seconds or more) • Driving at constant speed of 40km/h (25mph) with selector lever in 2 range • Driving at constant speed of 70km/h (43mph) with selector lever in D range	• 3 • 2	valve A (SCSV-A)	system
				Shift control solenoid valve B (SCSV-B)	Code P0755 - Shift control solenoid valve B system
				Shift control solenoid valve C (SCSV-C)	Code P0760 - Shift control solenoid valve C system
			• OFF • ON • ON • OFF	Kickdown servo switch	Code P1709 - Kickdown servo switch system
			• 0km/h • 10km/h • 50km/h • 40km/h	Vehicle speed sensor	Vehicle speed sensor system
			(3) 1,500~2,000rpm	Pulse generator A (PG-A)	Code P0717 - Pulse generator A system
			(3) 1,500~2,000rpm	Pulse generator B (PG-B)	Code P0722 - Pulse generator B system
			(3) 100~300rpm (5) 0~10rpm	Torque converter clutch solenoid	Code P0743 - Torque converter clutch solenoid
			(5) TCCS Duty : 40~85	Torque converter clutch solenoid	Code P0743 - Torque converter clutch solenoid
			For (3) and (5), acceleration should be smooth with no abnormal vibration	Malfunction while driving	Poor acceleration
					Vibration
	Selector lever position:D Overdrive:ON	Engine (1) Driving at constant speed of 50km/h (31mph) (20 seconds or more)	(1) 3 speed gear (1) 1,500~2,000rpm	Shift control solenoid valve A (SCSV-A)	Code P0750 - Shift control solenoid valve A system
				Shift control solenoid valve B (SCSV-B)	Code P0755 - Shift control solenoid valve B system

7				Shift control solenoid valve C (SCSV-C)	Code P0760 - Shift control solenoid valve C system
				Pulse generator A (PG-A)	Code P0717 - Pulse generator A system
				Pulse generator B (PG-B)	Code P0722 - Pulse generator B system
8	Selector lever position:D Overdrive:ON	• Accelerate to 4th gear at TPS output of 1.5V (opening angle 30%) • Slowly decelerate to a standstill • Accelerate to 4th gear at TPS output of 2.5V (opening angle 50%) • At 50km/h (31mph) in 4th gear, turn overdrive OFF • At 50km/h (31mph) in 3rd gear, move selector lever to 2 range • At 20km/h (12mph) in 2 range, move selector lever to L range.	For (1), (2) and (3) should match the specified output shaft speed (vehicle speed0, and there should be no abnormal shocks. For (4), (5) and (6), down shifting should be made immediately after operation.	Malfunction when shifting	Shocks and flare shifts
				Displaced shifting points	All points
				Does not shift	No fail-safe codes
					Code P0717 - Pulse generator A system
					Code P0722 - Pulse generator B system
					Code P0750 - Shift contorl solenoid valve A system
					Code P0755 - Shift control solenoid valve B stystem
					Code P0760 - Shift contorl solenoid valve C system
					Code P0745, P0775 - Pressure control solenoid valve system
					Code P0731 - 1st gear incorrect ratio
					Code P0732 - 2nd gear incorrect ratio
					Code P0733 - 3rd gear incorrect ratio
					Code P0734 - 4th gear incorrect ratio

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

DTC NO	Diagnosis items	Trouble area (Remedy)	MIL
	Fluid temperature sensor		

P0711	Fluid temperature sensor -rationality check-	• Fluid temperature sensor connector inspection • Fluid temperature sensor inspection • Fluid temperature sensor wiring harness inspection	O
P0712	Fluid temperature sensor -short circuit-		
P0713	Fluid temperature sensor -open circuit-		
P0717	Pulse generator A -open circuit-	• Check the pulse generator A and pulse generator B • Check the vehicle speed reed switch (for chattering) • Check the pulse generator A and B wiring harness	O
P0722	Pulse generator B -open circuit-		
P0750	Shift control solenoid valve A	• Check the solenoid valve connector • Check the shift control solenoid valve A • Check the shift control solenoid valve A wiring harness	O
P0755	Shift control solenoid valve B	• Check the solenoid valve connector • Check the shift control solenoid valve B • Check the shift control solenoid valve A wiring harness	O
P0760	Shift control solenoid valve C	• Check the solenoid valve connector • Check the shift control solenoid valve C • Check the shift control solenoid valve A wiring harness	O
P0707	Transaxle range switch -No signal-	• Check the transaxle range switch connector and harness	O
P0708	Transaxle range switch -Multi signal-		
P0745	Pressure control solenoid - A valve open circuit	• Check the pressure control solenoid valve • Check the pressure control solenoid valve wiring harness	O
P0775	Pressure control solenoid - B valve shor circuit		
P0743	Damper clutch control solenoid	• Inspection of solenoid valve connector • Individual inspection of damper clutch control solenoid valve • Check the damper clutch control solenoid valve wiring harness • Check the PCM • Inspection of damper clutch hydraulic system	O
P0741	Damper clutch -Stuck OFF-		
P0742	Damper clutch -Stuck ON-		
P0731	First gear system -Malfunction-	• Check the pulse generator A and pulse generator B connector • Check the one way clutch or rear clutch • Check the pulse generator wiring harness	O
P0732	Second gear system -Malfunction-		

P0733	Third gear system -Malfunction-	• Check the rear clutch or control system • Check the pulse generator A and pulse generator B connector • Check the front clutch slippage or control system • Check the pulse generator wiring harness • Check the rear clutch slippage or control system	O
P0734	Fourth gear system -Malfunction-	• Check the pulse generator A and pulse generator B connector • Kickdown brake slippage • Check the end clutch or control system • Check the pulse generator wiring harness	O

FAIL-SAFE ITEM

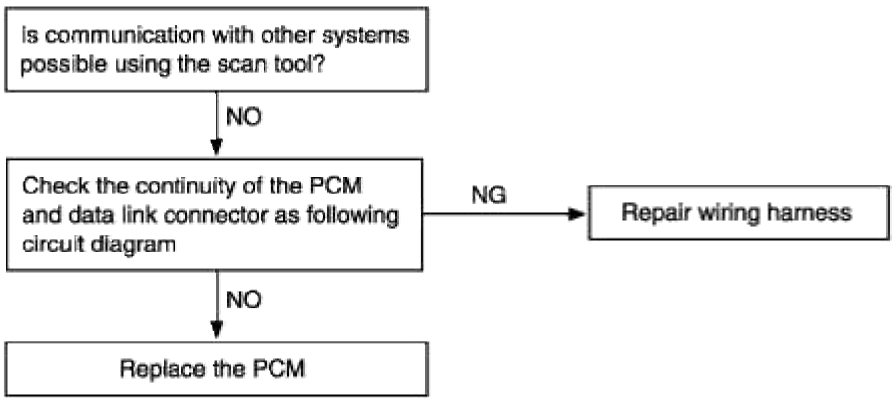
DTC NO	Description	Fail-safe	Note (Relation to diagnostic trouble code)
P0717	Open-circuited pulse generator A	Locked in third (D) or second (2, L) gear	When code P0717 is generated fourth time
P0722	Open-circuited pulse generator B	Locked in third (D) or second (2,L) gear	When code P0722 is generated fourth time
P0750	Open-circuited or shorted shift control solenoid valve A	Lock in third gear	When code P0750 is generated fourth time
P0755	Open-circuited or shorted shift control solenoid valve B	Lock in third gear	When code P0755 is generated fourth time
P0760	Open-circuited or shorted shift control solenoid valve C	Lock in third gear	When code P0760 is generated fourth time
P0745 P0775	Open-circuited shorted pressure control solenoid valve	Lock in third (D) or second (2,L)	When codes P0745 or P0775 are generated fourth time
P0731 P0732 P0733 P0734	Gear shifting does not match the engine speed	Lock in third (D) or second (2,L)	When either codes P0731, P0732, P0733 or P0734 are generated fourth time

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with scan tool is not possible		1	TR-18
Driving impossible	Starting impossible (will not crank)	2	TR-19
	Does not move forward	3	TR-20
	Does not back-up	4	TR-21
	Does not move (forward or reverse)	5	TR-22
Malfunction when starting	Engine stalling during shifting	6	TR-23
	Shocks when shifting from N to D and long lag time	7	TR-24
	Shocks when shifting from N to R and long lag time	8	TR-25
	Shocks when shifting from N to D, N to R and long lag	9	TR-26
Malfunction when shifting	Shocks and flare shifts	10	TR-27
Early, late shift points	All points	11	TR-28
	Some points	12	TR-29
Does not shift	Does not shift	13	TR-30
Malfunction while driving	Poor acceleration	14	TR-31
	Vibration	15	TR-32
	Overdrive switch system	16	TR-33

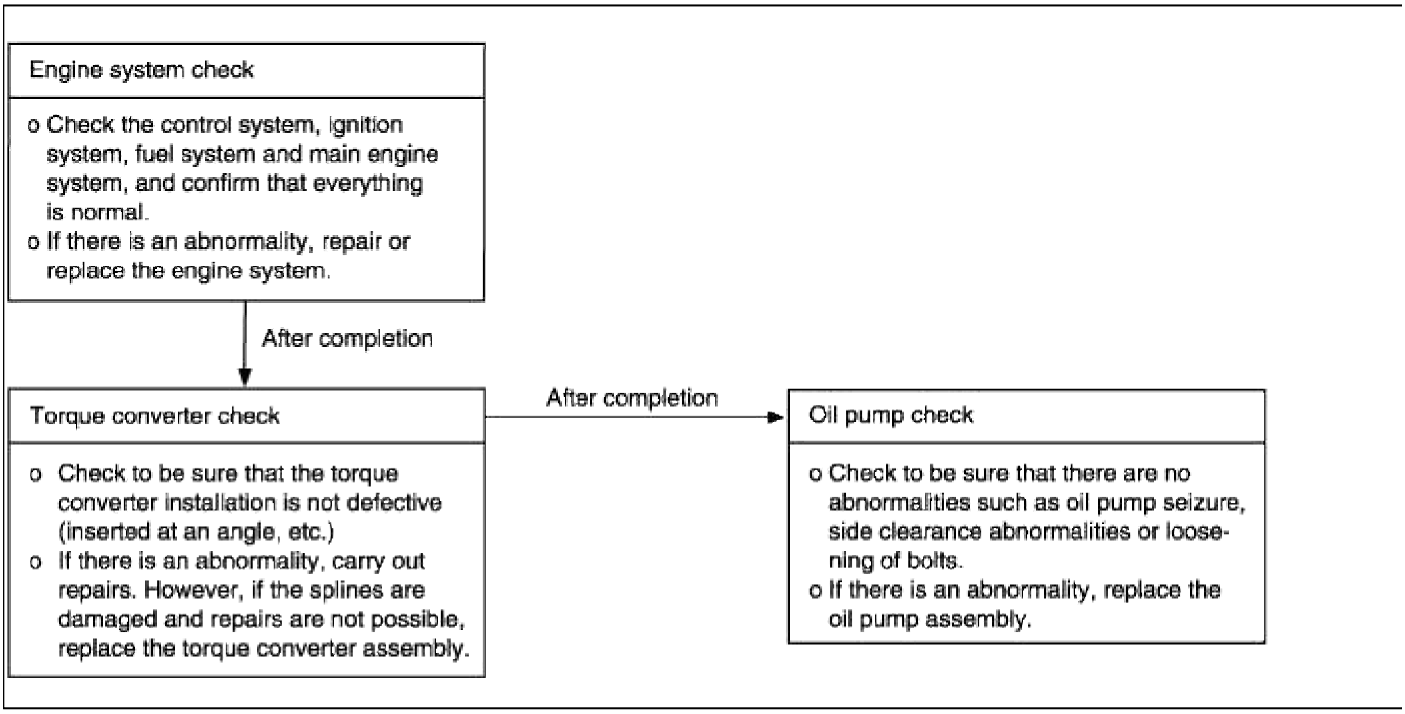
INSPECTION PROCEDURE 1

Communication with scan tool is not possible	Possible cause
If communiction with the scan tool is not possible, the cause may be a defective diagnosis line or PCM is not functioning	• Malfunction of diagnosis line • Malfunction of PCM power • Malfunction of PCM ground circuit • Malfunction of PCM


Is communication with other systems possible using the scan tool?
NO
Check the continuity of the PCM and data link connector as following circuit diagram
NG
Repair wiring harness
NO
Replace the PCM

INSPECTION PROCEDURE 2

Starting Impossible (will not crank)	Possible cause
Starting is not possible when the selector lever is in P or N range. In such cases, the cause may be a defective engine system, torque converter or oil pump.	• Malfunction of the engine system • Malfunction of the oil pump • Malfunction of the torque converter



Engine system check

o Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.

o If there is an abnormality, repair or replace the engine system.

Torque converter check

o Check to be sure that the torque converter installation is not defective (inserted at an angle, etc.)

o If there is an abnormality, carry out repairs. However, if the splines are damaged and repairs are not possible, replace the torque converter assembly.

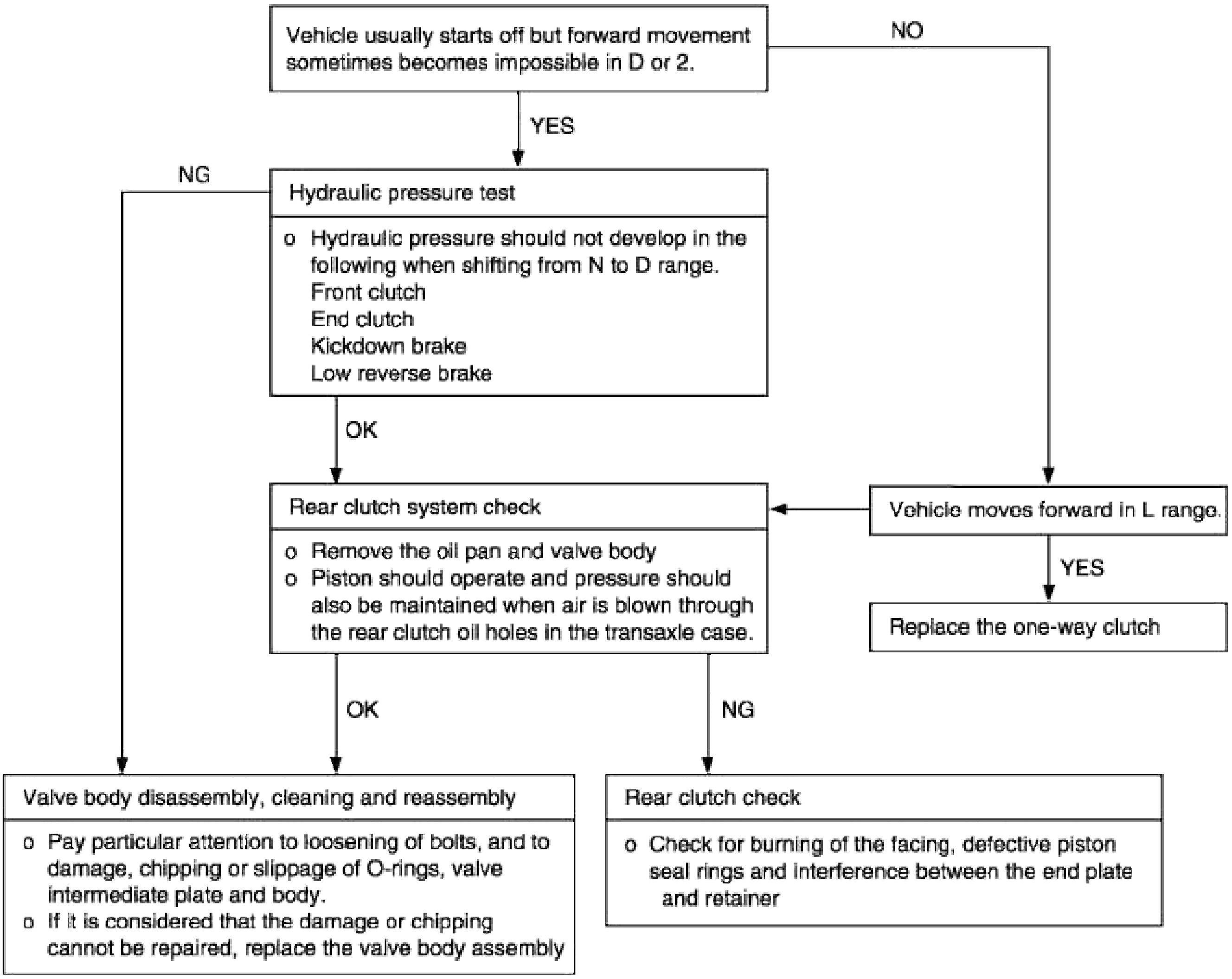
Oil pump check

o Check to be sure that there are no abnormalities such as oil pump seizure, side clearance abnormalities or loosening of bolts.

o If there is an abnormality, replace the oil pump assembly.

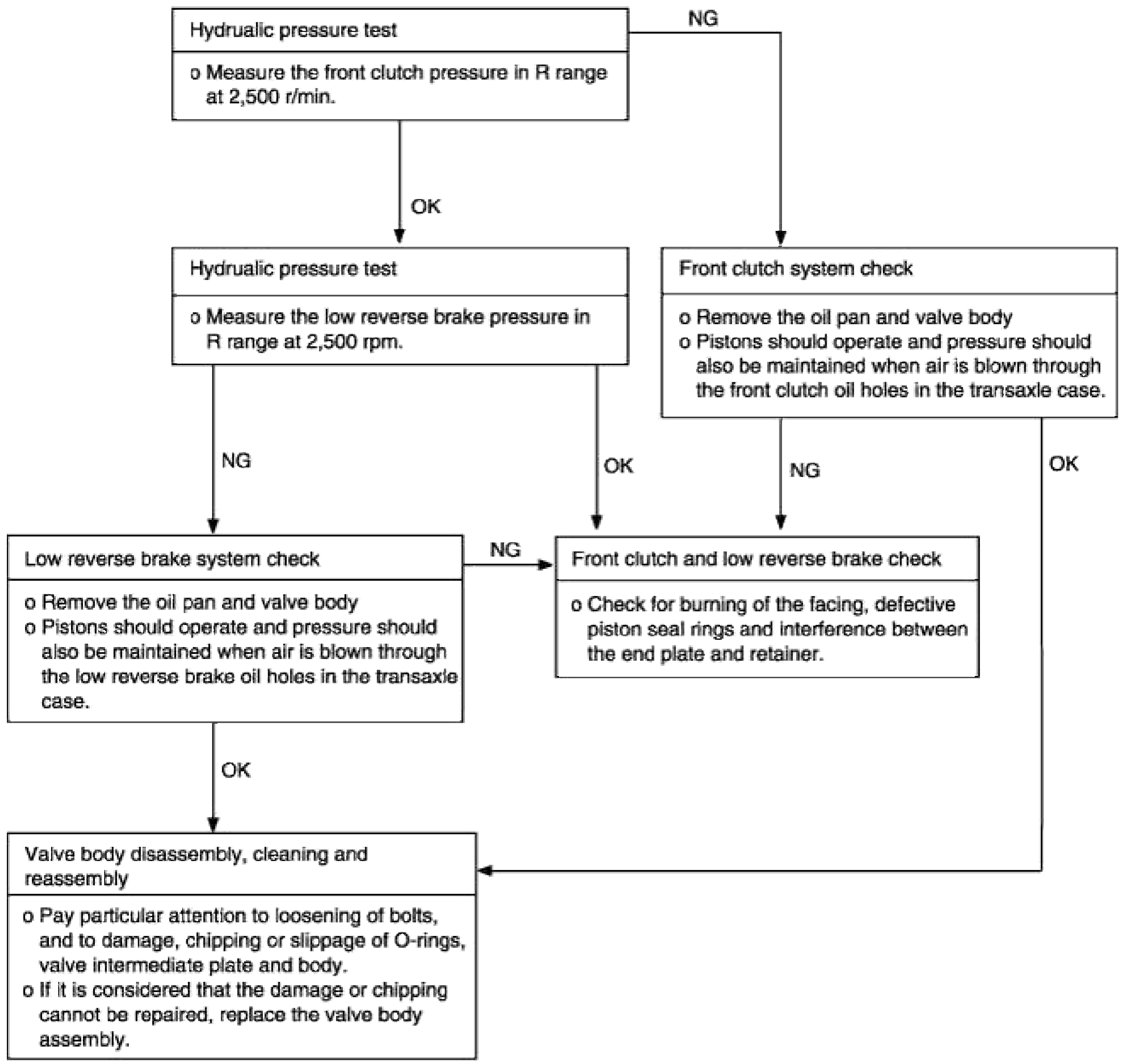
INSPECTION PROCEDURE 3

Does not move forward	Possible cause
When the engine is idling, the vehicle does not move forward even if the selector lever is shifted from N to D, 2 or L range. In such cases, the cause may be abnormal line pressure; a defective rear clutch or a one-way clutch.	• Abnormal line pressure • Malfunction of rear clutch • Malfunction of one-way clutch • Malfunction of valve body


Vehicle usually starts off but forward movement sometimes becomes impossible in D or 2.
NO
YES
NG
Hydraulic pressure test
o Hydraulic pressure should not develop in the following when shifting from N to D range.
Front clutch
End clutch
Kickdown brake
Low reverse brake
OK
Rear clutch system check
o Remove the oil pan and valve body
o Piston should operate and pressure should also be maintained when air is blown through the rear clutch oil holes in the transaxle case.
Vehicle moves forward in L range.
YES
Replace the one-way clutch
OK
NG
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly
Rear clutch check
o Check for burning of the facing, defective piston seal rings and interference between the end plate and retainer

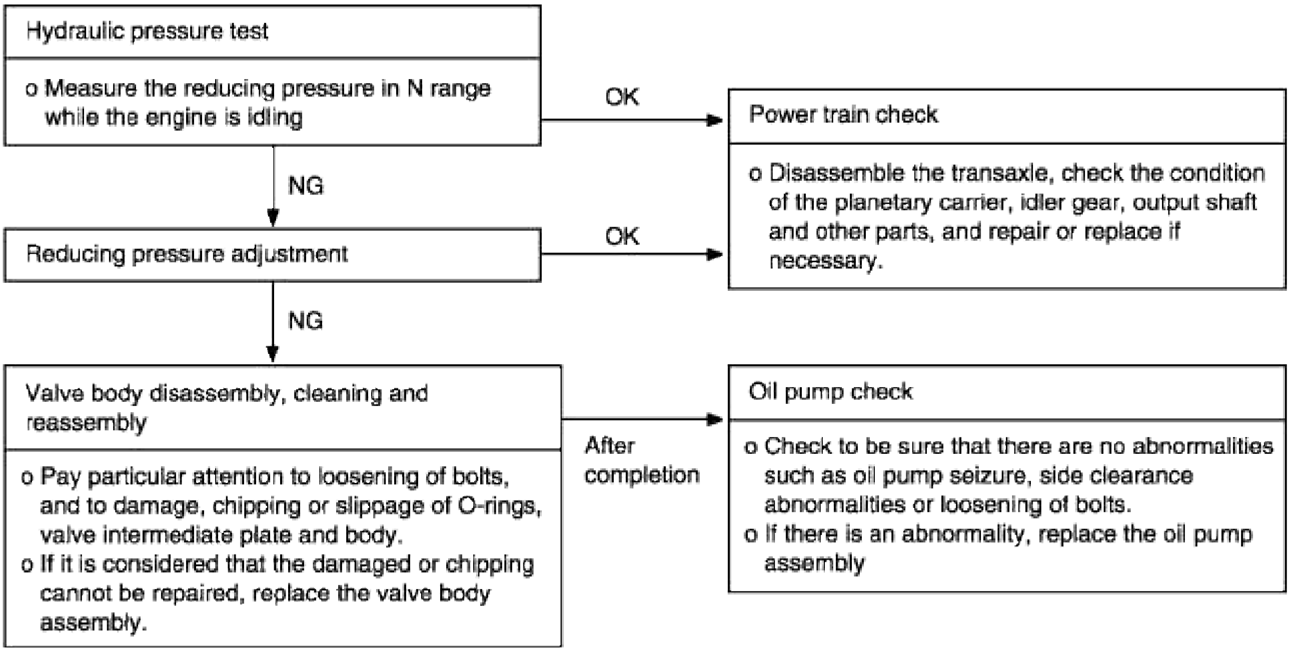
INSPECTION PROCEDURE 4

Does not move back-up	Possible cause
When the engine is idling, the vehicle does not back-up even if the selector lever is shifted from N to R range. In such cases, the cause may be abnormal pressure in the low reverse brake or front clutch, or a defective low reverse brake or front clutch.	• Abnormal low reverse brake pressure • Abnormal front clutch pressure • Malfunction of front clutch • Malfunction of low reverse brake • Malfunction of valve body


Hydrualic pressure test
o Measure the front clutch pressure in R range at 2,500 r/min.
NG
OK
Hydrualic pressure test
o Measure the low reverse brake pressure in R range at 2,500 rpm.
Front clutch system check
o Remove the oil pan and valve body
o Pistons should operate and pressure should also be maintained when air is blown through the front clutch oil holes in the transaxle case.
NG
OK
NG
OK
Low reverse brake system check
o Remove the oil pan and valve body
o Pistons should operate and pressure should also be maintained when air is blown through the low reverse brake oil holes in the transaxle case.
NG
Front clutch and low reverse brake check
o Check for burning of the facing, defective piston seal rings and interference between the end plate and retainer.
OK
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURE 5

Does not move (forward or reverse)	Possible cause
When the engine is idling, the vehicle does not move forward or reverse even if the selector lever is shifted from N to D, 2, L or R range. In such cases, the cause may be abnormal reducing pressure, or a defective oil pump or power train.	• Abnormal reducing pressure • Malfunction of power train • Malfunctin of oil pump • Malfunction of valve body



Hydraulic pressure test

o Measure the reducing pressure in N range while the engine is idling

Reducing pressure adjustment

Valve body disassembly, cleaning and reassembly

o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damaged or chipping cannot be repaired, replace the valve body assembly.

Power train check

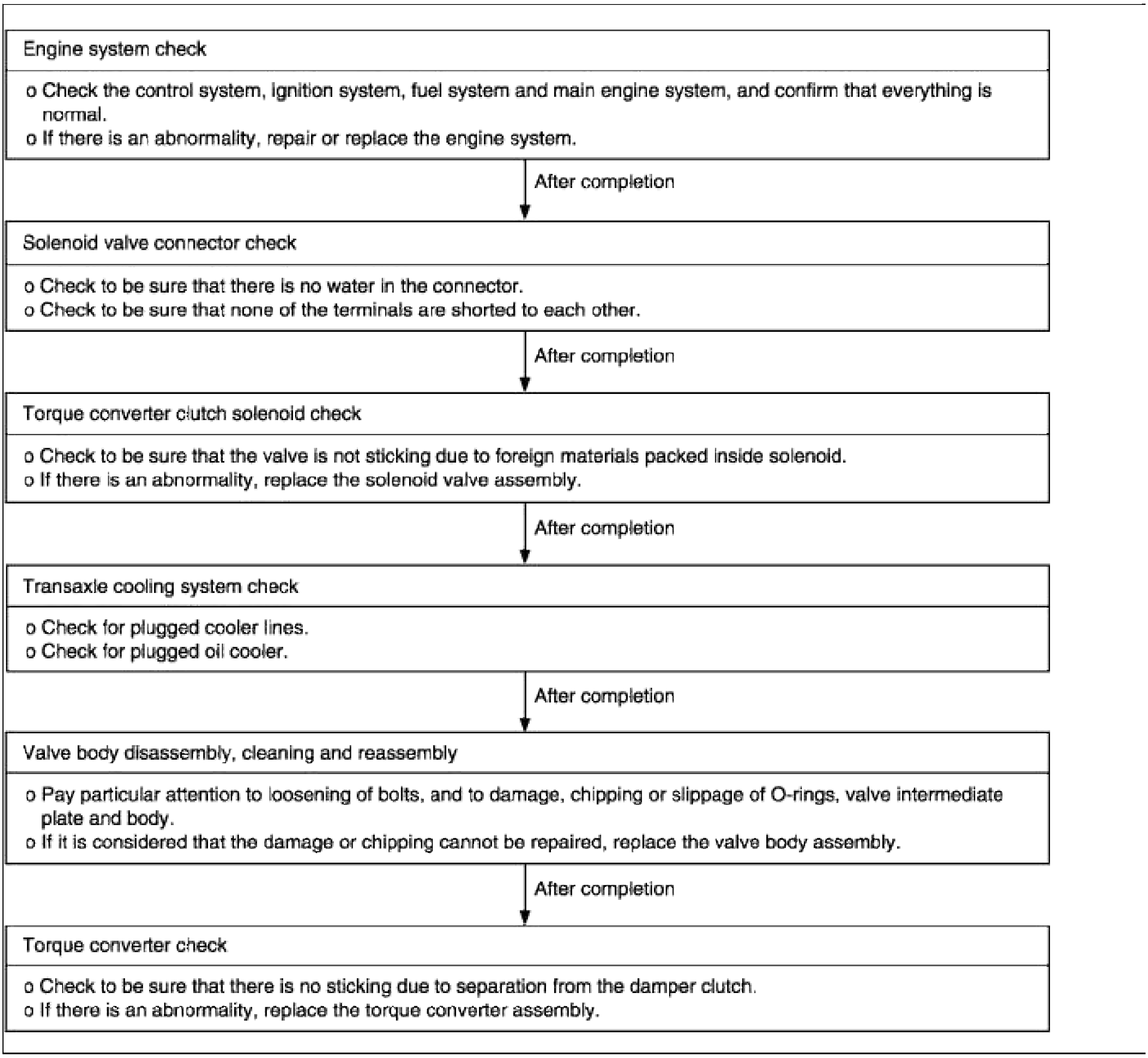
o Disassemble the transaxle, check the condition of the planetary carrier, idler gear, output shaft and other parts, and repair or replace if necessary.

Oil pump check

o Check to be sure that there are no abnormalities such as oil pump seizure, side clearance abnormalities or loosening of bolts.
o If there is an abnormality, replace the oil pump assembly

INSPECTION PROCEDURE 6

Engine stalling during shifting	Possible cause
When the engine is idling, the engine stalls when the selector lever is shifted from N to D, 2, L or R range. In such cases, the cause may be a defective engine system or damper clutch control solenoid valve.	• Malfunction of engine system • Malfunction of torque converter clutch solenoid • Malfunction of valve body • Malfunction of torque converter



Engine system check

- o Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.
- o If there is an abnormality, repair or replace the engine system.

After completion

Solenoid valve connector check

- o Check to be sure that there is no water in the connector.
- o Check to be sure that none of the terminals are shorted to each other.

After completion

Torque converter clutch solenoid check

- o Check to be sure that the valve is not sticking due to foreign materials packed inside solenoid.
- o If there is an abnormality, replace the solenoid valve assembly.

After completion

Transaxle cooling system check

- o Check for plugged cooler lines.
- o Check for plugged oil cooler.

After completion

Valve body disassembly, cleaning and reassembly

- o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
- o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

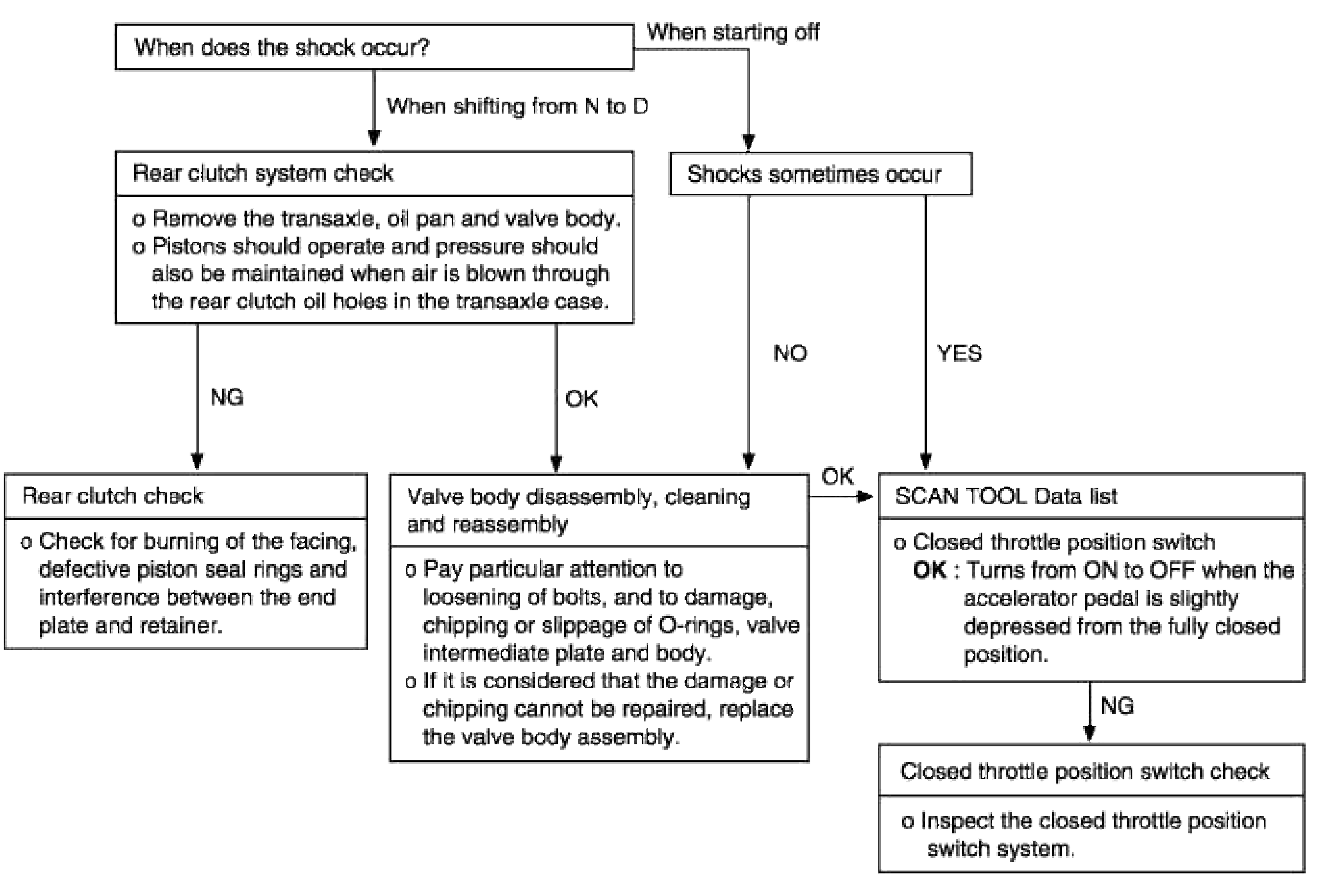
After completion

Torque converter check

- o Check to be sure that there is no sticking due to separation from the damper clutch.
- o If there is an abnormality, replace the torque converter assembly.

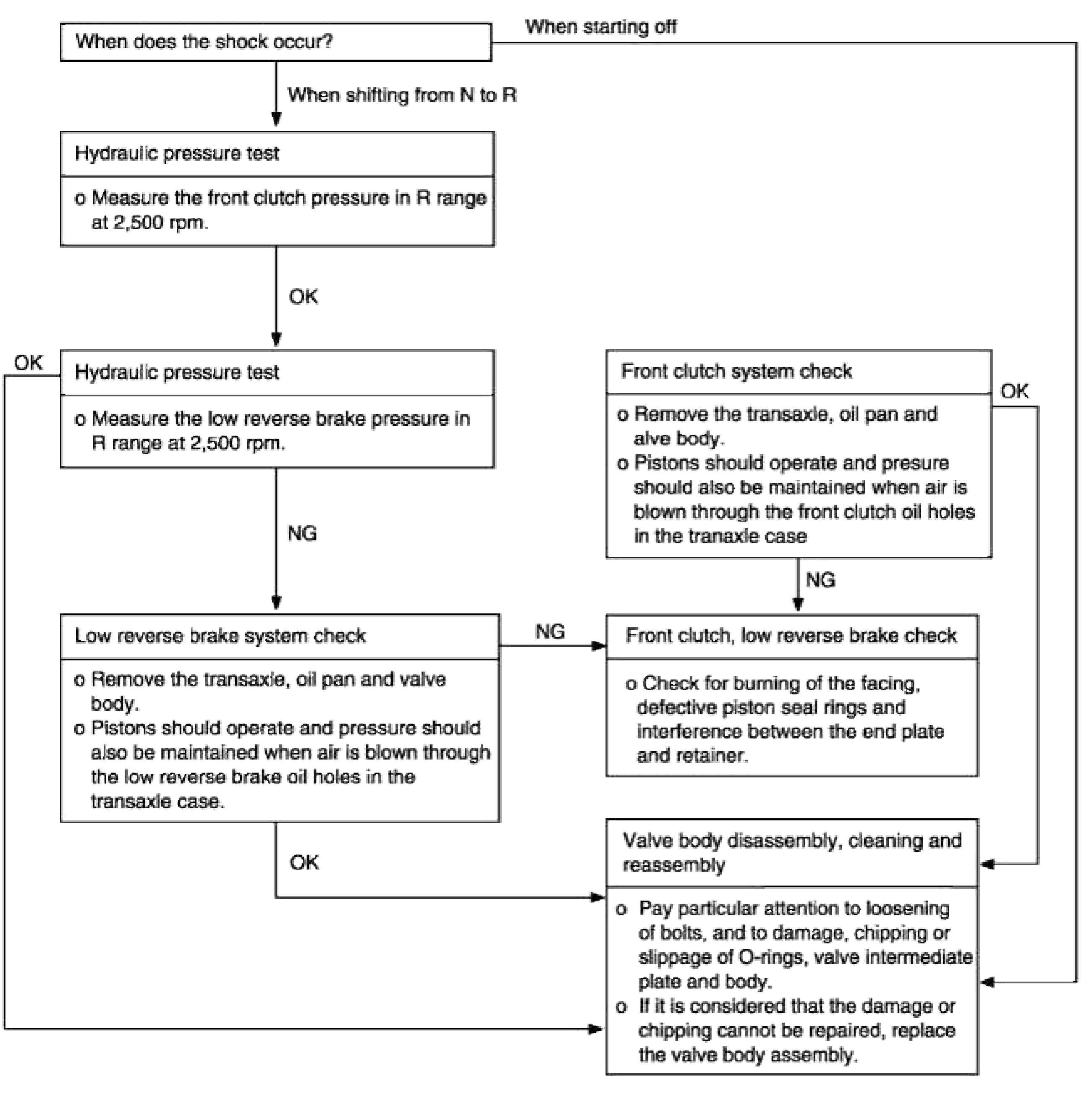
INSPECTION PROCEDURE 7

Shocks when shifting from N to D and long lag time	Possible cause
When the engine is idling, abnormal shocks or a lag time of 2 seconds or more occur when the selector lever is shifted from N to D range. In such case, the cause may be a defective rear clutch or valve body.	• Malfunction of rear clutch • Malfunction of valve body • Malfunction of closed throttle position switch


When does the shock occur?
When starting off
When shifting from N to D
Rear clutch system check
o Remove the transaxle, oil pan and valve body.
o Pistons should operate and pressure should also be maintained when air is blown through the rear clutch oil holes in the transaxle case.
Shocks sometimes occur
NG
OK
NO
YES
Rear clutch check
o Check for burning of the facing, defective piston seal rings and interference between the end plate and retainer.
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.
OK
SCAN TOOL Data list
o Closed throttle position switch
OK : Turns from ON to OFF when the accelerator pedal is slightly depressed from the fully closed position.
NG
Closed throttle position switch check
o Inspect the closed throttle position switch system.

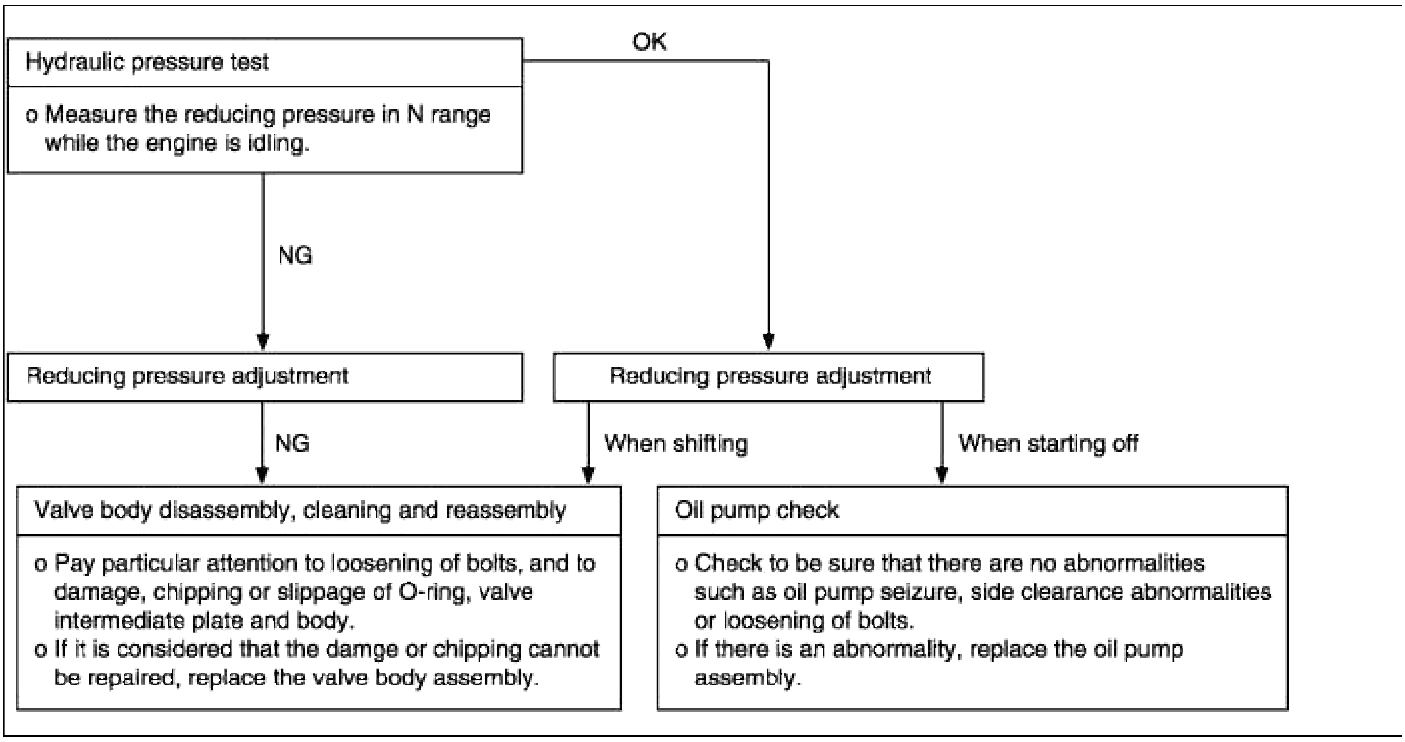
INSPECTION PROCEDURE 8

Shocks when shifting from N to R and long lag time	Possible cause
When the engine is idling, abnormal shocks or a lag time of 2 seconds or more occurs when the selector lever is shifted from N to R range. In such cases, the cause may be abnormal low reverse brake or front clutch pressure, or a defective low reverse brake or front clutch.	• Abnormal front clutch pressure • Abnormal low reverse brake pressure • Malfunction of front clutch • Malfunction of low reverse brake • Malfuntion of valve body


When does the shock occur?
When starting off
When shifting from N to R
Hydraulic pressure test
o Measure the front clutch pressure in R range at 2,500 rpm.
OK
OK
Hydraulic pressure test
o Measure the low reverse brake pressure in R range at 2,500 rpm.
Front clutch system check
o Remove the transaxle, oil pan and alve body.
o Pistons should operate and presure should also be maintained when air is blown through the front clutch oil holes in the tranaxle case
OK
NG
NG
Low reverse brake system check
o Remove the transaxle, oil pan and valve body.
o Pistons should operate and pressure should also be maintained when air is blown through the low reverse brake oil holes in the transaxle case.
NG
Front clutch, low reverse brake check
o Check for burning of the facing, defective piston seal rings and interference between the end plate and retainer.
OK
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURE 9

Shocks when shifting from N to D,N to R and long lag time	Possible cause
When the engine is idling, abnormal shocks or a lag time of 2 seconds or more occur when the selector lever is shifted from N to D range and from N to R range. In such cases, the cause may be abnormal reducing pressure or a defective oil pump.	• Abnormal reducing pressure • Malfunction of oil pump • Malfunction of valve body


Hydraulic pressure test
OK
NG
Reducing pressure adjustment
Reducing pressure adjustment
NG
When shifting
When starting off
Valve body disassembly, cleaning and reassembly
Oil pump check

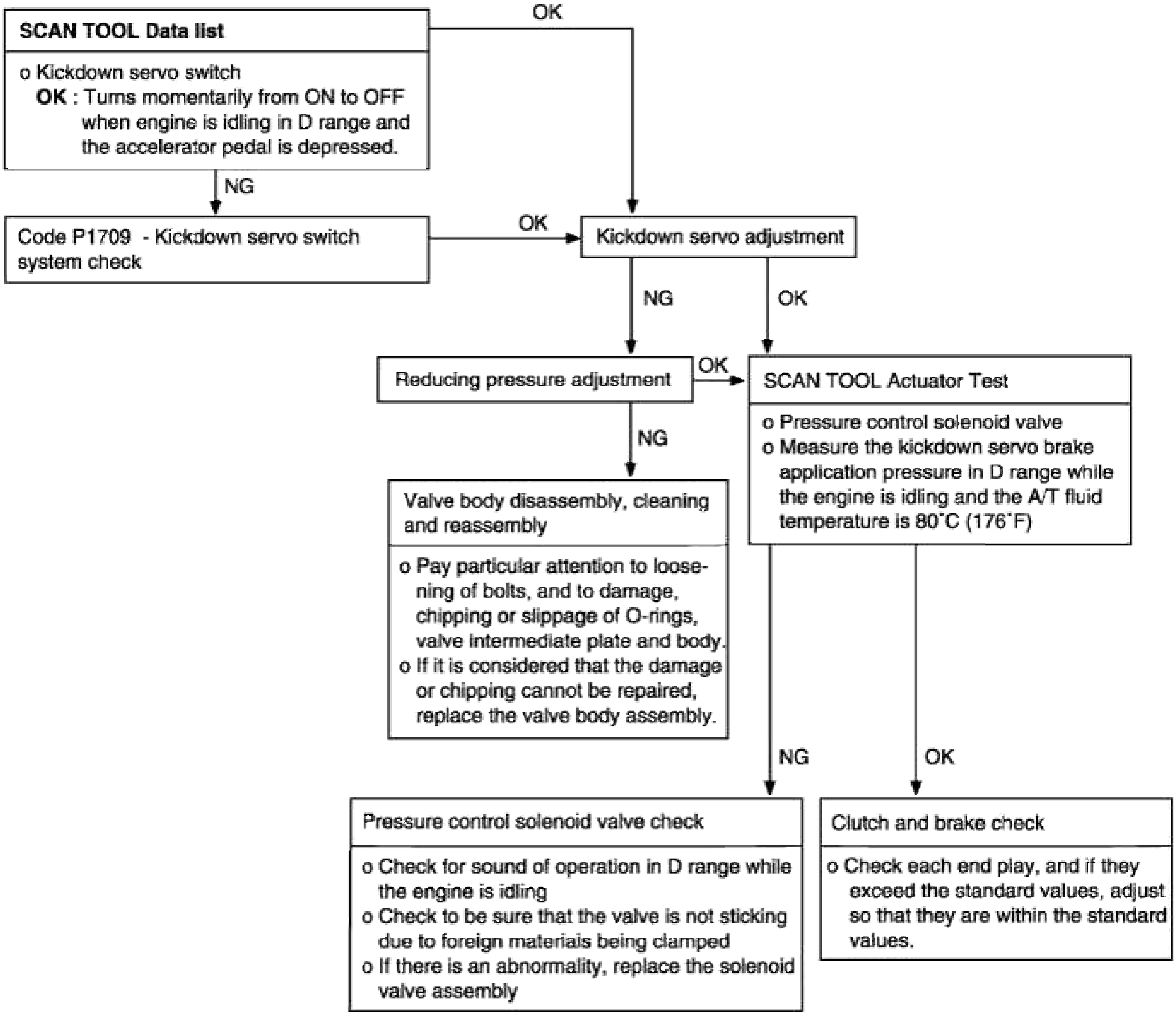
o Measure the reducing pressure in N range while the engine is idling.

o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-ring, valve intermediate plate and body.
o If it is considered that the damge or chipping cannot be repaired, replace the valve body assembly.

o Check to be sure that there are no abnormalities such as oil pump seizure, side clearance abnormalities or loosening of bolts.
o If there is an abnormality, replace the oil pump assembly.

INSPECTION PROCEDURE 10

Shocks and flare shifts	Probable cause
Shocks occur when driving due to upshifting or downshifting. In addition,the engine speed during shifting increases abnormally in comparison to normal shifting. In such cases, the cause is probably abnormal reducing pressure or a defective kickdown servo switch.	• Malfunction of kickdown servo switch • Abnormal reducing pressure • Malfunction of valve body • Malfunction of closed throttle position switch • Malfunction of pressure control solenoid valve • Malfunction of clutches and brakes



SCAN TOOL Data list

o Kickdown servo switch
OK : Turns momentarily from ON to OFF when engine is idling in D range and the accelerator pedal is depressed.

Code P1709 - Kickdown servo switch system check

Kickdown servo adjustment

Reducing pressure adjustment

SCAN TOOL Actuator Test

o Pressure control solenoid valve
o Measure the kickdown servo brake application pressure in D range while the engine is idling and the A/T fluid temperature is 80°C (176°F)

Valve body disassembly, cleaning and reassembly

o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

Pressure control solenoid valve check

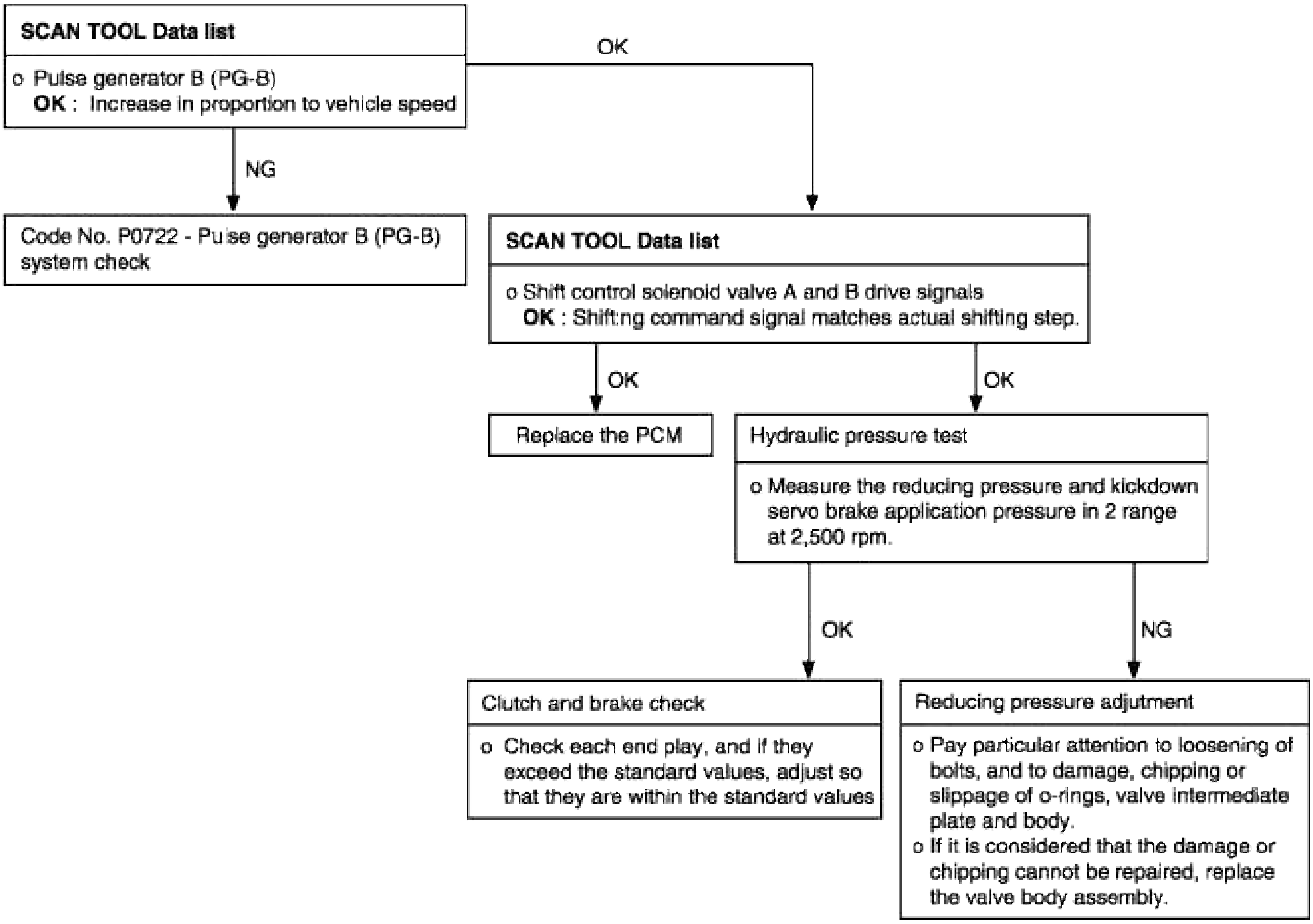
o Check for sound of operation in D range while the engine is idling
o Check to be sure that the valve is not sticking due to foreign materials being clamped
o If there is an abnormality, replace the solenoid valve assembly

Clutch and brake check

o Check each end play, and if they exceed the standard values, adjust so that they are within the standard values.

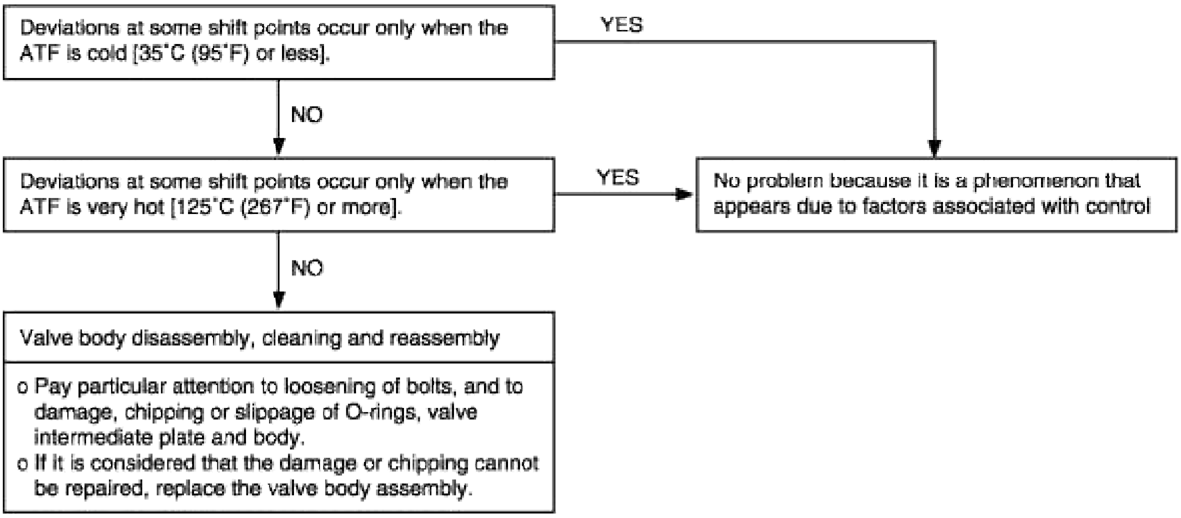
INSPECTION PROCEDURE 11

All points (Early, late shifting points)	Possible cause
All shift points occurs early, late while driving. In such cases, the cause may be a defective pulse generator B (PG-B) or shift control solenoid valve A or B (SCSV-A, B).	• Malfunction of pulse generator B (PG-B) • Malfunction of shift control solenoid valve A or B (SCSV-A, B) • Malfunction of PCM • Abnormal reducing pressure or kickdown servo brake application pressure • Malfunction of clutches and brake


SCAN TOOL Data list
o Pulse generator B (PG-B)
OK : Increase in proportion to vehicle speed
OK
NG
Code No. P0722 - Pulse generator B (PG-B) system check
SCAN TOOL Data list
o Shift control solenoid valve A and B drive signals
OK : Shifting command signal matches actual shifting step.
OK
OK
Replace the PCM
Hydraulic pressure test
o Measure the reducing pressure and kickdown servo brake application pressure in 2 range at 2,500 rpm.
OK
NG
Clutch and brake check
o Check each end play, and if they exceed the standard values, adjust so that they are within the standard values
Reducing pressure adjutment
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of o-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

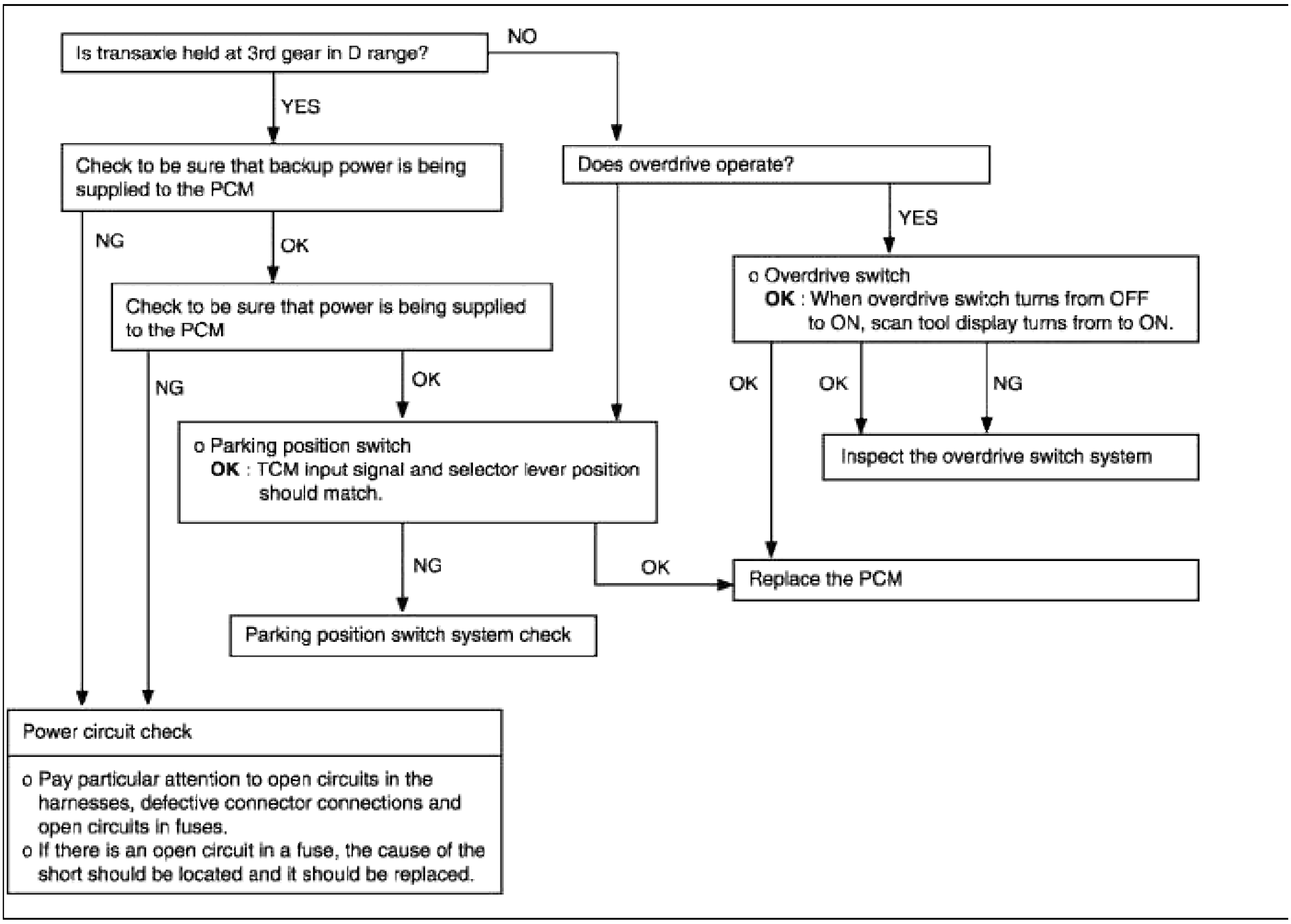
INSPECTION PROCEDURE 12

Some points (Early, late shifting points)	Possible cause
Some shift points occurs early, late while driving. In such cases, the cause may be a defective valve body, or it is phenomenon related to control and is not an abnormality.	• Malfunction of valve body


Deviations at some shift points occur only when the ATF is cold [35°C (95°F) or less].
YES
NO
Deviations at some shift points occur only when the ATF is very hot [125°C (267°F) or more].
YES
No problem because it is a phenomenon that appears due to factors associated with control
NO
Valve body disassembly, cleaning and reassembly
o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

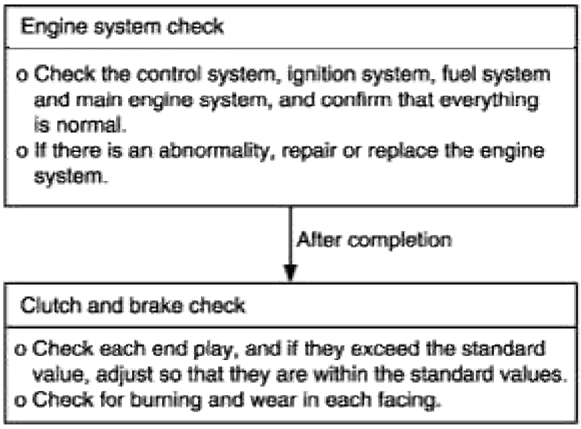
INSPECTION PROCEDURE 13

Does not shift	Possible cause
Shifting does not occur while driving, and no fail-safe codes are output. In such cases, the cause may be a defective overdrive switch or parking switch.	• Malfunction of overdrive switch • Malfunction of parking position switch • Malfunction of power supply circuit • Malfunction of PCM


Is transaxle held at 3rd gear in D range?
NO
YES
Check to be sure that backup power is being supplied to the PCM
Does overdrive operate?
YES
NG
OK
o Overdrive switch
OK : When overdrive switch turns from OFF to ON, scan tool display turns from to ON.
Check to be sure that power is being supplied to the PCM
NG
OK
OK
OK
NG
Inspect the overdrive switch system
o Parking position switch
OK : TCM input signal and selector lever position should match.
NG
OK
Replace the PCM
Parking position switch system check
Power circuit check
o Pay particular attention to open circuits in the harnesses, defective connector connections and open circuits in fuses.
o If there is an open circuit in a fuse, the cause of the short should be located and it should be replaced.

INSPECTION PROCEDURE 14

Poor acceleration	Possible cause
While driving, acceleration is poor even if downshifting is performed. In such cases, the cause may be a defective clutch, brake or a defective engine system.	• Malfunction of clutch and brakes • Malfunction of engine system



Engine system check

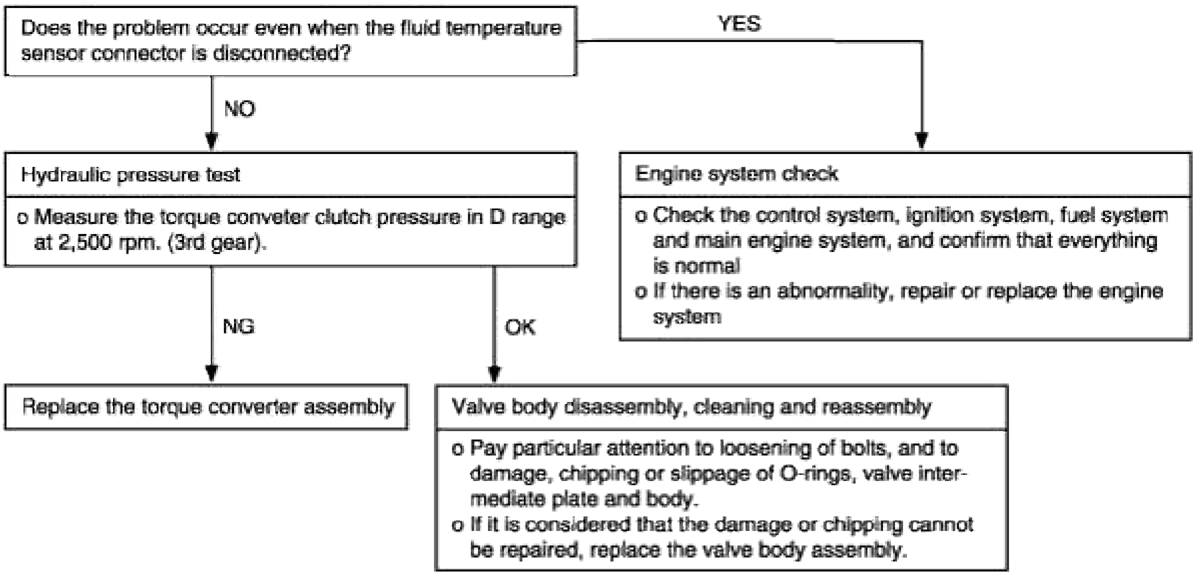
o Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.
o If there is an abnormality, repair or replace the engine system.

Clutch and brake check

o Check each end play, and if they exceed the standard value, adjust so that they are within the standard values.
o Check for burning and wear in each facing.

INSPECTION PROCEDURE 15

Vibration	Possible cause
Vibration occurs when driving at constant speed or when accelerating in top range. In such case, the cause may be abnormal torque converter clutch pressure or a defective torque converter.	• Abnormal torque converter clutch pressure • Malfunction of engine system • Malfunction of torque converter • Malfunction of valve body



Does the problem occur even when the fluid temperature sensor connector is disconnected?

Hydraulic pressure test

o Measure the torque conveter clutch pressure in D range at 2,500 rpm. (3rd gear).

Engine system check

o Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal
o If there is an abnormality, repair or replace the engine system

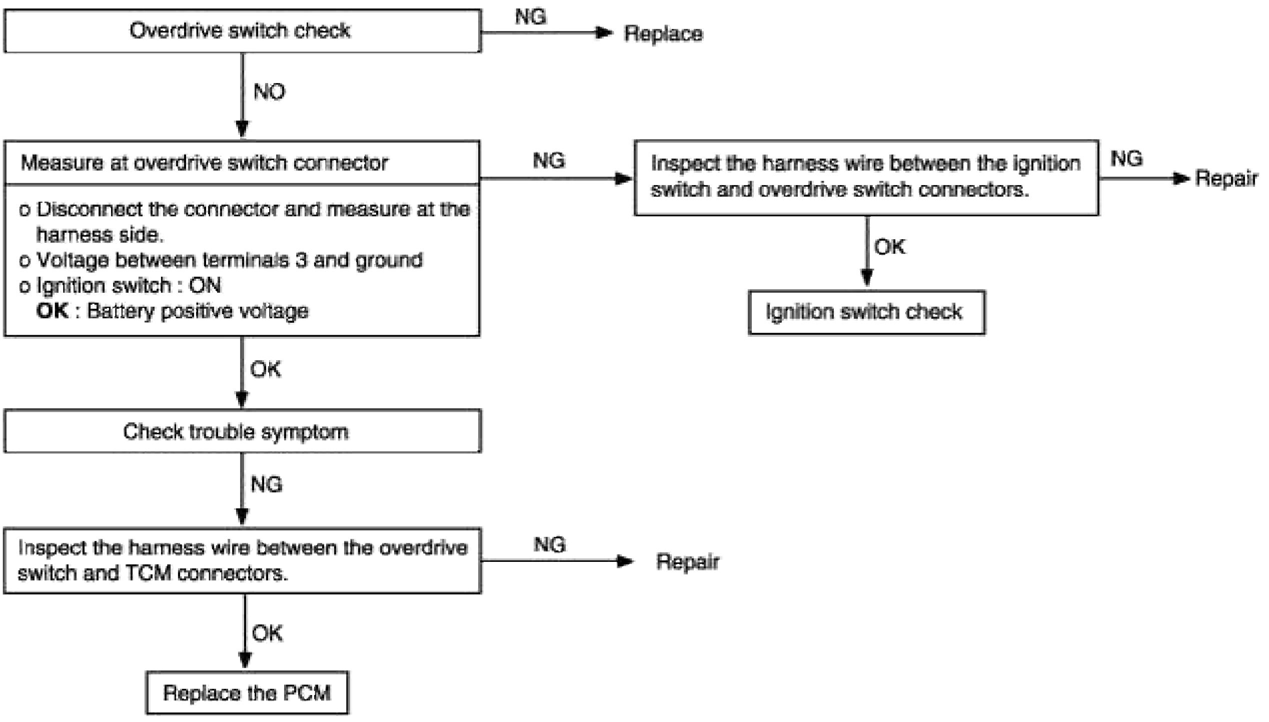
Replace the torque converter assembly

Valve body disassembly, cleaning and reassembly

o Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
o If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURE 16

Overdrive switch system	Possible cause
In cases such as the above, the cause may be a defective overdrive switch circuit or defective ignition switch circuit.	• Malfunction of overdrive switch • Malfunction of connector • Malfunction of ignition switch • Malfunction of PCM


Overdrive switch check
NG
Replace
NO
Measure at overdrive switch connector
o Disconnect the connector and measure at the harness side.
o Voltage between terminals 3 and ground
o Ignition switch : ON
OK : Battery positive voltage
NG
Inspect the harness wire between the ignition switch and overdrive switch connectors.
NG
Repair
OK
Ignition switch check
OK
Check trouble symptom
NG
Inspect the harness wire between the overdrive switch and TCM connectors.
NG
Repair
OK
Replace the PCM

OBTAINING DIAGNOSTIC TROUBLE CODES

[USING HI-SCAN PRO]

1. Turn the ignition switch OFF.
2. Connect the Hi-Scan Pro to the data link connector.
3. Turn the ignition switch ON.
4. Use the Hi-Scan Pro to check the diagnostic trouble code.
5. Repair the faulty part from the diagnosis chart.
6. Erase the diagnostic trouble code.
7. Disconnect the Hi-Scan Pro.

MALFUNCTION INDICATOR LIGHT (MIL)

An on-board diagnostic light comes on to notify the driver that there is problems in the vehicle. However, when an irregular state returns to normal, the malfunction indicator light will go out automatically after 3 driving cycles that have no same fault. Immediately after the ignition switch is turned on, the malfunction indicator light operates normally. (See FL-section)

THE FOLLOWING ITEMS WILL BE INDICATED BY THE MIL

- Fluid temperature sensor
- Pulse generator A (PG-A)
- Pulse generator B (PG-B)
- Shift control solenoid valve A (SCSV-A)
- Shift control solenoid valve B (SCSV-B)
- Shift control solenoid valve C (SCSV-C)
- Pressure control solenoid valve (PCSV-A)
- Pressure control solenoid valve B (PCSV-B)
- Damper clutch solenoid valve (DCCSV)
- Shift stage synchronize
- Transaxle range switch

SERVICE DATA (WHEN A HI-SCAN PRO IS USED)

Diagnosis items	Checking procedures		Checking items (Remedy)
	Check conditions	Normal value	

Throttle position sensor (TPS)	Accelerator pedal fully released	2 ~ 18 %	• TPS or circuit harness if no change occurs • TPS or accelerator pedal cable if gradual change is not noted
	Press accelerator pedal slowly	Varies with accelerator opening	
	Accelerator pedal pressed to floor	80 ~ 100%	
Fluid temperature sensor	Cold engine (before starting)	Equivalent to outside air temperature	• Fluid temperature sensor or circuit harness
	While warming up engine	Gradual increase	
	After warming up engine	70 ~ 110°C	
Kickdown servo switch	L range : Idling	ON	• Kickdown servo misadjusted • Kickdown servo switch or circuit harness • Kickdown servo
	D range : First or third gear	ON	
	D range : Second or fourth gear	OFF	
Engine speed	P range : Idling Accelerator pedal : Fully closed	600 ~ 800rpm	• Ignition system • Ignition signal pick-up circuit harness
	P range : Idling Accelerator pedal : depressed		
Air conditioning relay signals	P range : Idle, air conditioning ON	ON	• Air conditioning power relay circuit harness
	P range : Idle, air conditioning OFF	OFF	
Shift position	1st speed : 10km/h	First	• PCM • Transaxle range switch system • TPS system
	2nd speed : 30km/h	Second	
	3rd speed : 50km/h	Third	
	4th speed : 80km/h	Fourth	
Pulse generator A	D range (OD OFF) : driving at 50 km/h (31 mph) in third gear	1,500 ~ 2,000rpm	• Pulse generator A or circuit harness • Pulse generator A shielded wire • Incoming noise from outside
	D range (OD ON) : driving at 80 km/h (50 mph) in fourth gear	1,700 ~ 2,000rpm	
Pulse generator B	D range (OD OFF) : driving at 50 km/h (31 mph) in third gear	1,500 ~ 2,000rpm	• Pulse generator B or circuit harness • Pulse generator B shielded wire • Incoming noise from outside
	D range (OD ON) : driving at 80 km/h (50 mph) in fourth gear	1,500 ~ 2,000rpm	
Overdrive switch	• Ignition switch : ON • Engine : stopped	OD-ON	• Overdrive switch or circuit harness

	• Overdrive switch is turned ON		
	• Ignition switch : ON • Engine : stopped • Overdrive switch is turned OFF	OD-OFF	
Transaxle range switch	Shift selector lever to P range	P	• Transaxle range switch misadjusted • Transaxle range switch or circuit harness • Manual control cable • If selector lever is inoperative, check shift lock mechanism
	Shift selector lever to R range	R	
	Shift selector lever to N range	N	
	Shift selector lever to D range	D	
	Shift selector lever to 2 range	2	
	Shift selector lever to L range	L	
Vehicle speed sensor	Keep vehicle stopped	0km/h	• Vehicle speed sensor if high speed signal is delivered while vehicle is stopping • In other cases, vehicle speed sensor or circuit harness
	Driving at 40 km/h (25 mph) in 2 range	40km/h (25 mph)	
	Driving at 50 km/h (31 mph) in D range, OD OFF	50km/h (31 mph)	
PCSV-A duty	D range : Idling	75 ~ 90%	• When accelerator pedal is slightly pressed while idling in D range, duty should become 100% • PCM • TPS system
	D range : first gear	100%	
PCSV-B duty	D range : Idling	0%	• PCM • TPS system
	D range : first gear	0%	
Torque converter slip amount	D range : third gear, 70km/h, OD OFF	0~50rpm	• Torque converter • Ignition signal wire or pulse generator A system • Inappropriate transaxle fluid pressure • Torque converter control solenoid valve
DCCSV duty	D range : third gear, 70km/h, OD OFF	40 ~ 85%	• PCM • TPS system

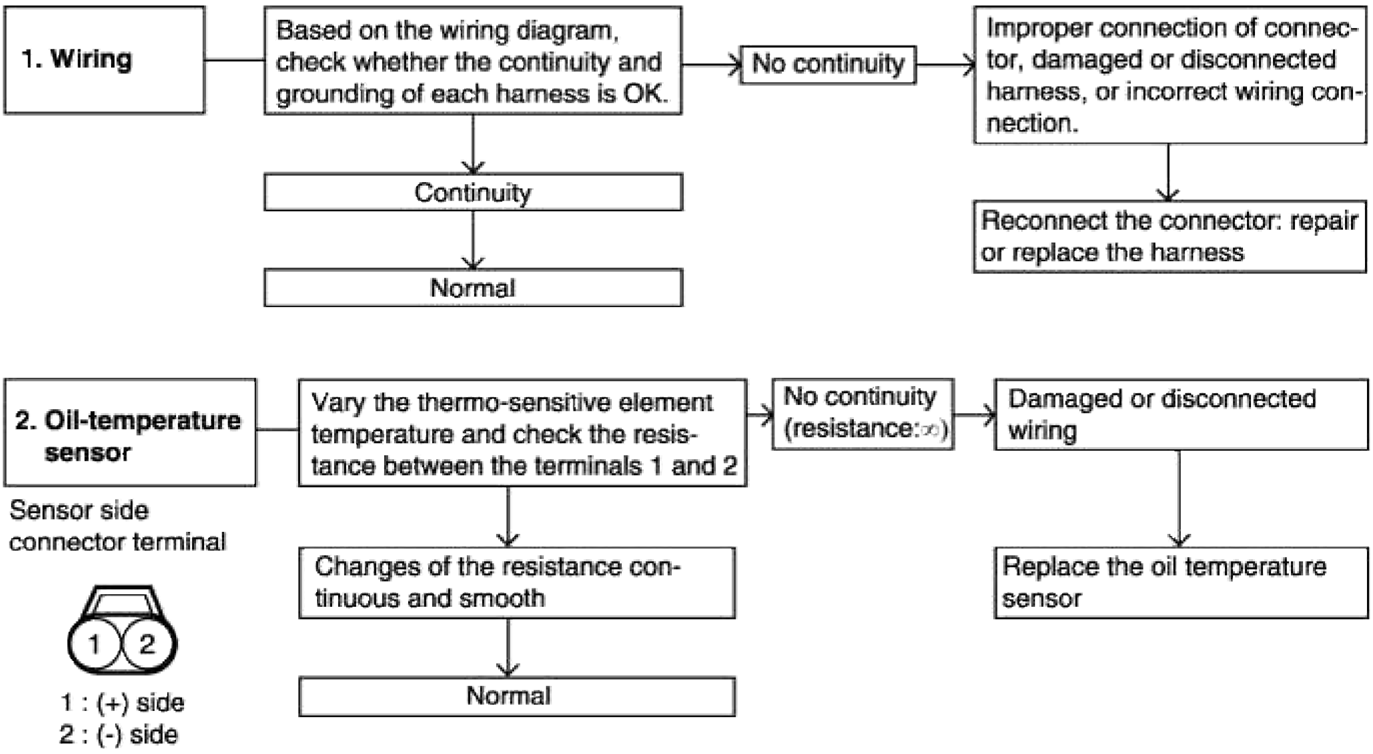
			• Pulse generator A system • Torque converter control solenoid valve

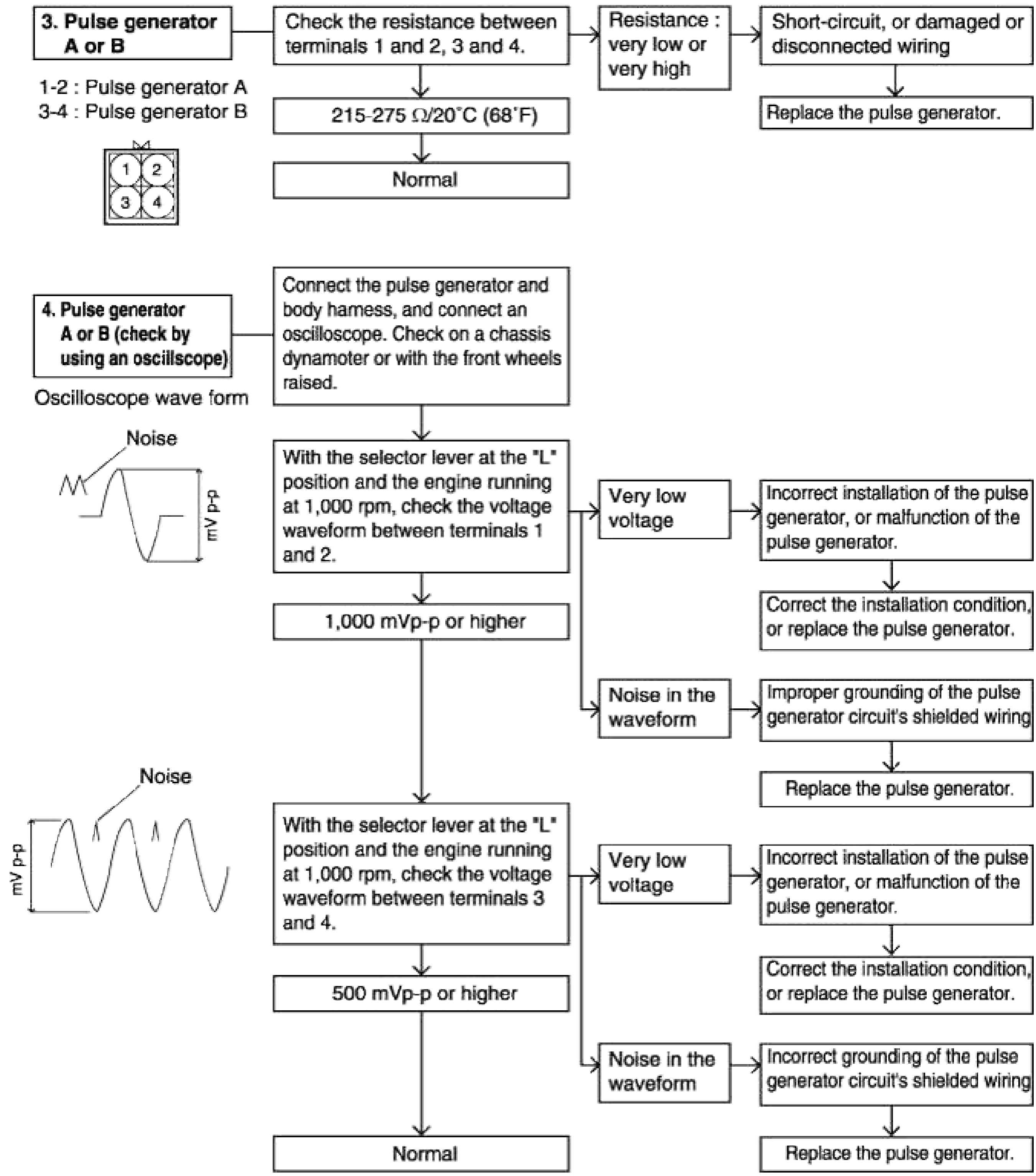
ELEMENTS IN USE IN EACH GEAR

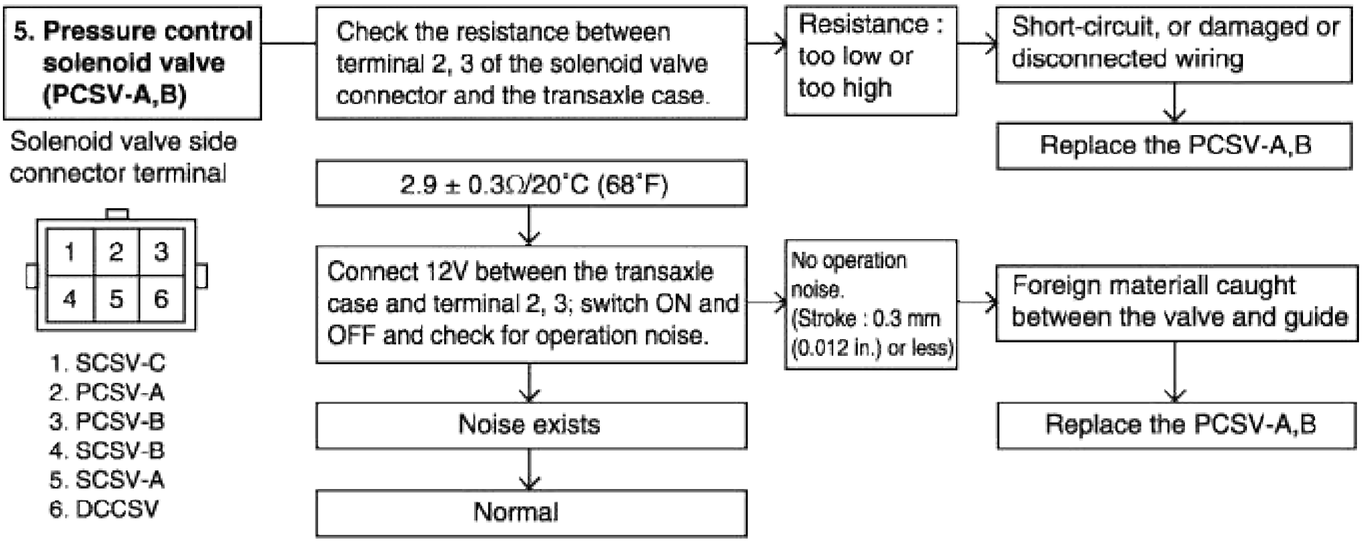
Select or lever position	Overdrive control switch	Shifting gear	Engine start	Parking Mechanism	Clutch				Brake	
					C1	C2	C3	OWC	B1	B2
P	-	Neutral	Possible	O						
R	-	Reverse			O					O
N	-	Neutral	Possible							
D	ON	First				O		O		
		Second				O			O	
		Third			O	O	O			
		Fourth					O		O	
D	OFF	First				O		O		
		Second				O			O	
		Third			O	O	O			
2	-	First				O		O		
		Second				O			O	
L	-	First				O				O

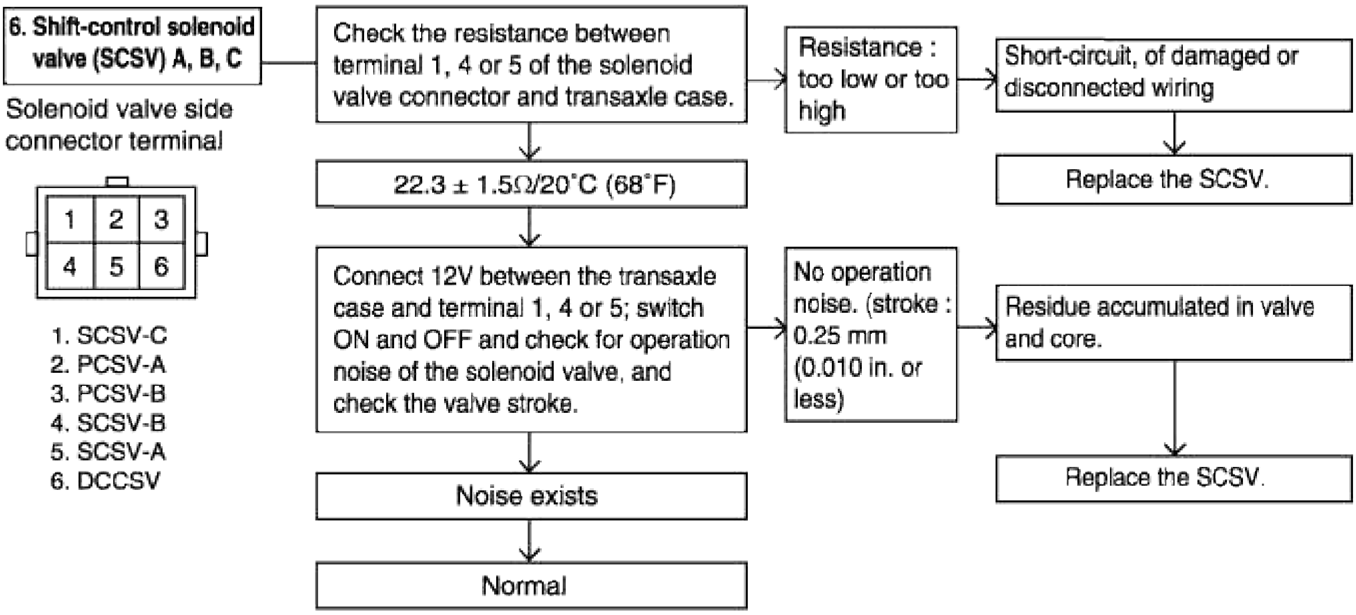
C1 : Front clutch
C2 : Rear clutch
C3 : End clutch
OWC : One way clutch
B1 : Kickdown brake
B2 : Low&reverse brake

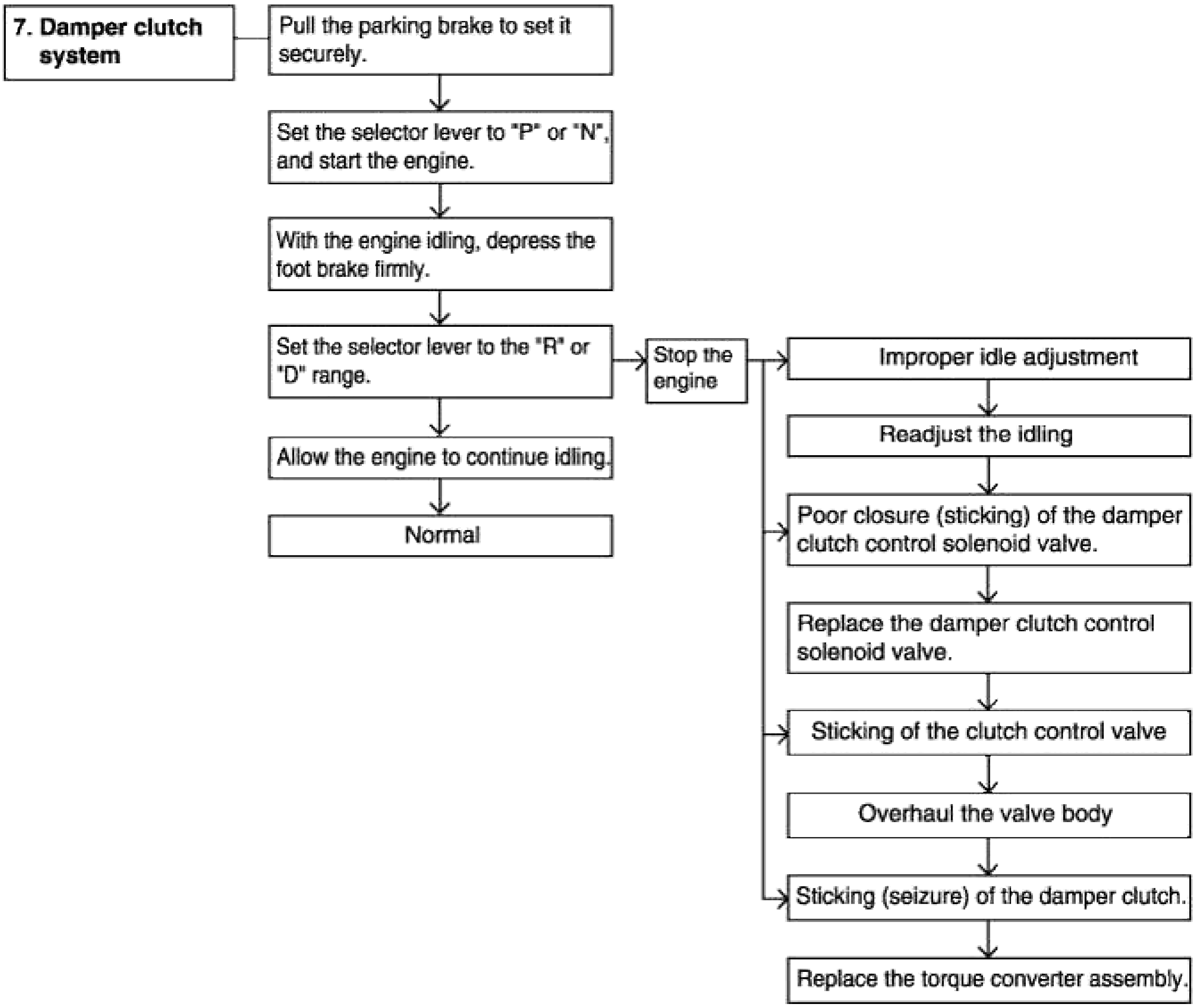
INSPECTION OF ELECTRONIC CONTROL SYSTEM COMPONENTS

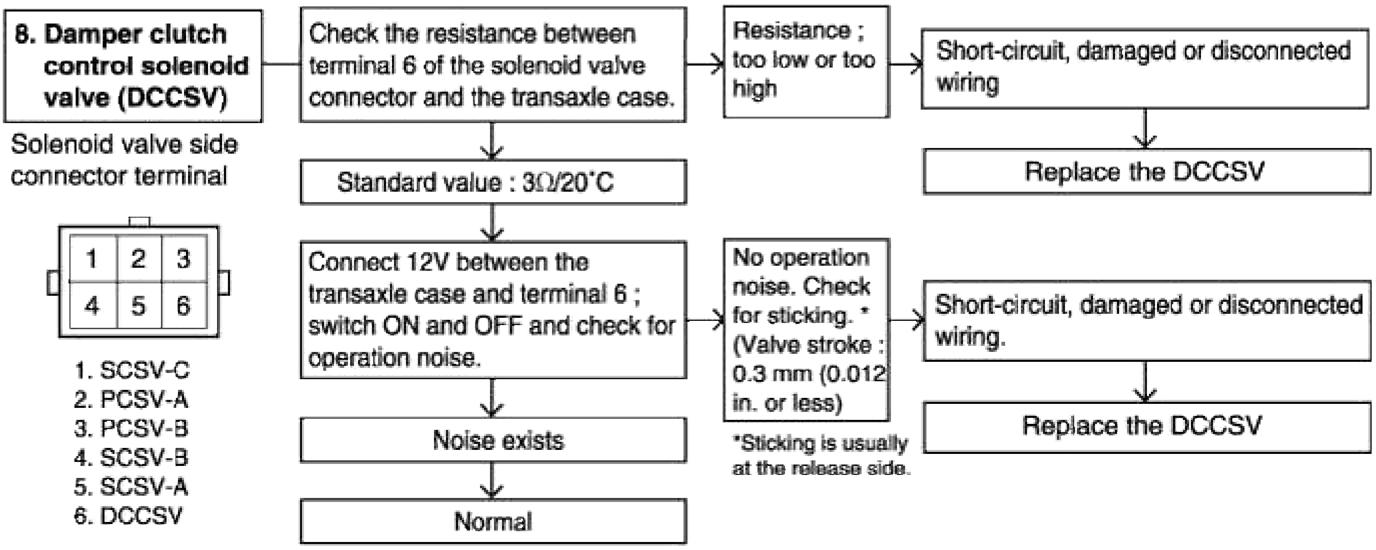

1. Wiring
Based on the wiring diagram, check whether the continuity and grounding of each harness is OK.
No continuity
Improper connection of connector, damaged or disconnected harness, or incorrect wiring connection.
Reconnect the connector: repair or replace the harness
Continuity
Normal
2. Oil-temperature sensor
Vary the thermo-sensitive element temperature and check the resistance between the terminals 1 and 2
No continuity (resistance:∞)
Damaged or disconnected wiring
Replace the oil temperature sensor
Changes of the resistance continuous and smooth
Normal
Sensor side connector terminal
1
2
1 : (+) side
2 : (-) side


3. Pulse generator A or B
1-2 : Pulse generator A
3-4 : Pulse generator B
1
2
3
4
Check the resistance between terminals 1 and 2, 3 and 4.
215-275 Ω/20°C (68°F)
Normal
Resistance : very low or very high
Short-circuit, or damaged or disconnected wiring
Replace the pulse generator.
4. Pulse generator A or B (check by using an oscillscope)
Oscilloscope wave form
Noise
mV p-p
Connect the pulse generator and body harness, and connect an oscilloscope. Check on a chassis dynamoter or with the front wheels raised.
With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 1 and 2.
1,000 mVp-p or higher
Very low voltage
Incorrect installation of the pulse generator, or malfunction of the pulse generator.
Correct the installation condition, or replace the pulse generator.
Noise in the waveform
Improper grounding of the pulse generator circuit's shielded wiring
Replace the pulse generator.
Noise
mV p-p
With the selector lever at the "L" position and the engine running at 1,000 rpm, check the voltage waveform between terminals 3 and 4.
500 mVp-p or higher
Very low voltage
Incorrect installation of the pulse generator, or malfunction of the pulse generator.
Correct the installation condition, or replace the pulse generator.
Noise in the waveform
Incorrect grounding of the pulse generator circuit's shielded wiring
Replace the pulse generator.
Normal


5. Pressure control solenoid valve (PCSV-A,B)
Solenoid valve side connector terminal
1 2 3
4 5 6
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
Check the resistance between terminal 2, 3 of the solenoid valve connector and the transaxle case.
Resistance : too low or too high
Short-circuit, or damaged or disconnected wiring
Replace the PCSV-A,B
2.9 ± 0.3Ω/20˚C (68˚F)
Connect 12V between the transaxle case and terminal 2, 3; switch ON and OFF and check for operation noise.
No operation noise. (Stroke : 0.3 mm (0.012 in.) or less)
Foreign materiall caught between the valve and guide
Replace the PCSV-A,B
Noise exists
Normal

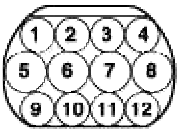

6. Shift-control solenoid valve (SCSV) A, B, C
Solenoid valve side connector terminal
1 2 3
4 5 6
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
Check the resistance between terminal 1, 4 or 5 of the solenoid valve connector and transaxle case.
Resistance : too low or too high
Short-circuit, of damaged or disconnected wiring
Replace the SCSV.
22.3 ± 1.5Ω/20˚C (68˚F)
Connect 12V between the transaxle case and terminal 1, 4 or 5; switch ON and OFF and check for operation noise of the solenoid valve, and check the valve stroke.
No operation noise. (stroke : 0.25 mm (0.010 in. or less)
Residue accumulated in valve and core.
Replace the SCSV.
Noise exists
Normal

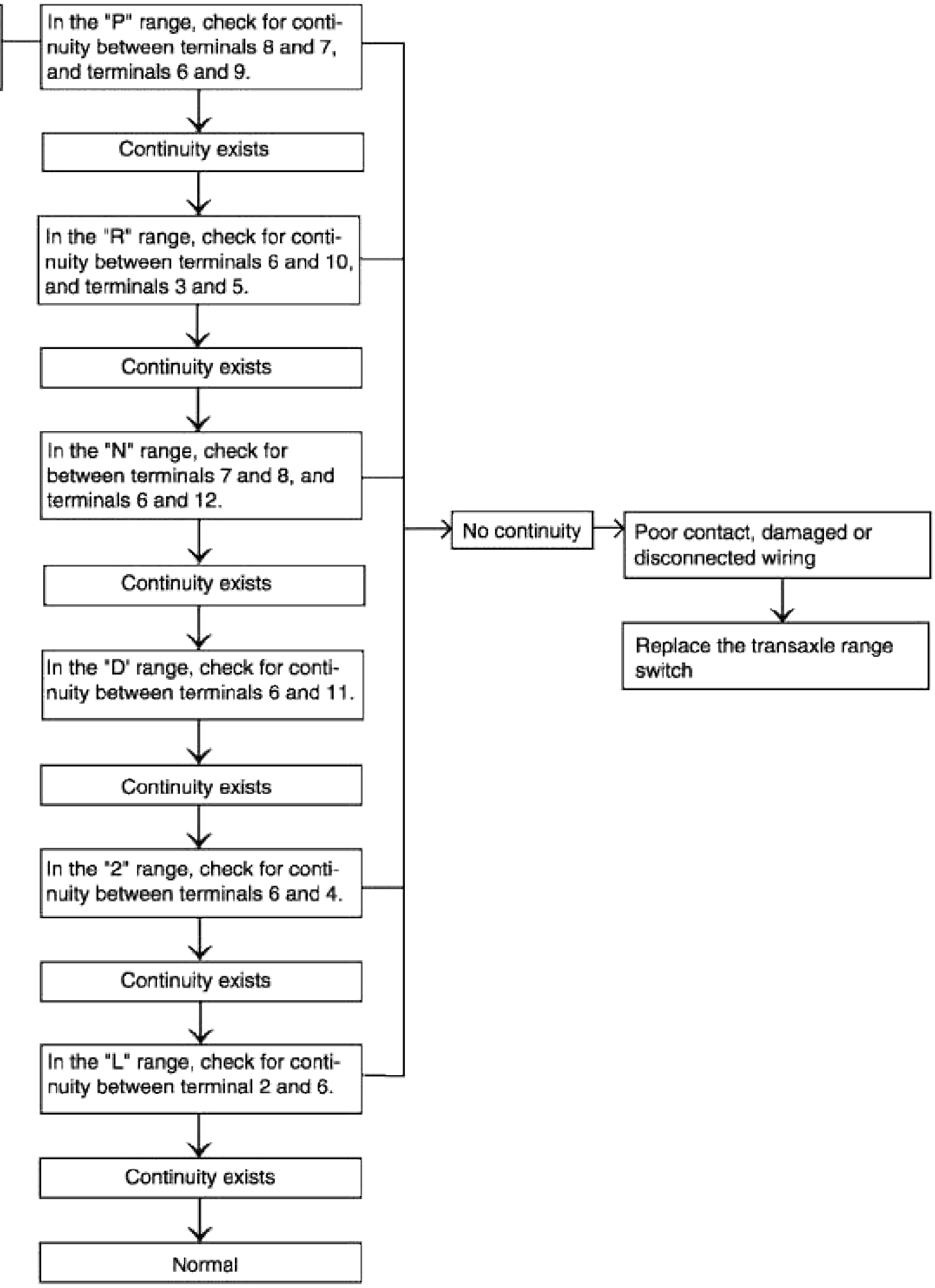

7. Damper clutch system
Pull the parking brake to set it securely.
Set the selector lever to "P" or "N", and start the engine.
With the engine idling, depress the foot brake firmly.
Set the selector lever to the "R" or "D" range.
Allow the engine to continue idling.
Normal
Stop the engine
Improper idle adjustment
Readjust the idling
Poor closure (sticking) of the damper clutch control solenoid valve.
Replace the damper clutch control solenoid valve.
Sticking of the clutch control valve
Overhaul the valve body
Sticking (seizure) of the damper clutch.
Replace the torque converter assembly.

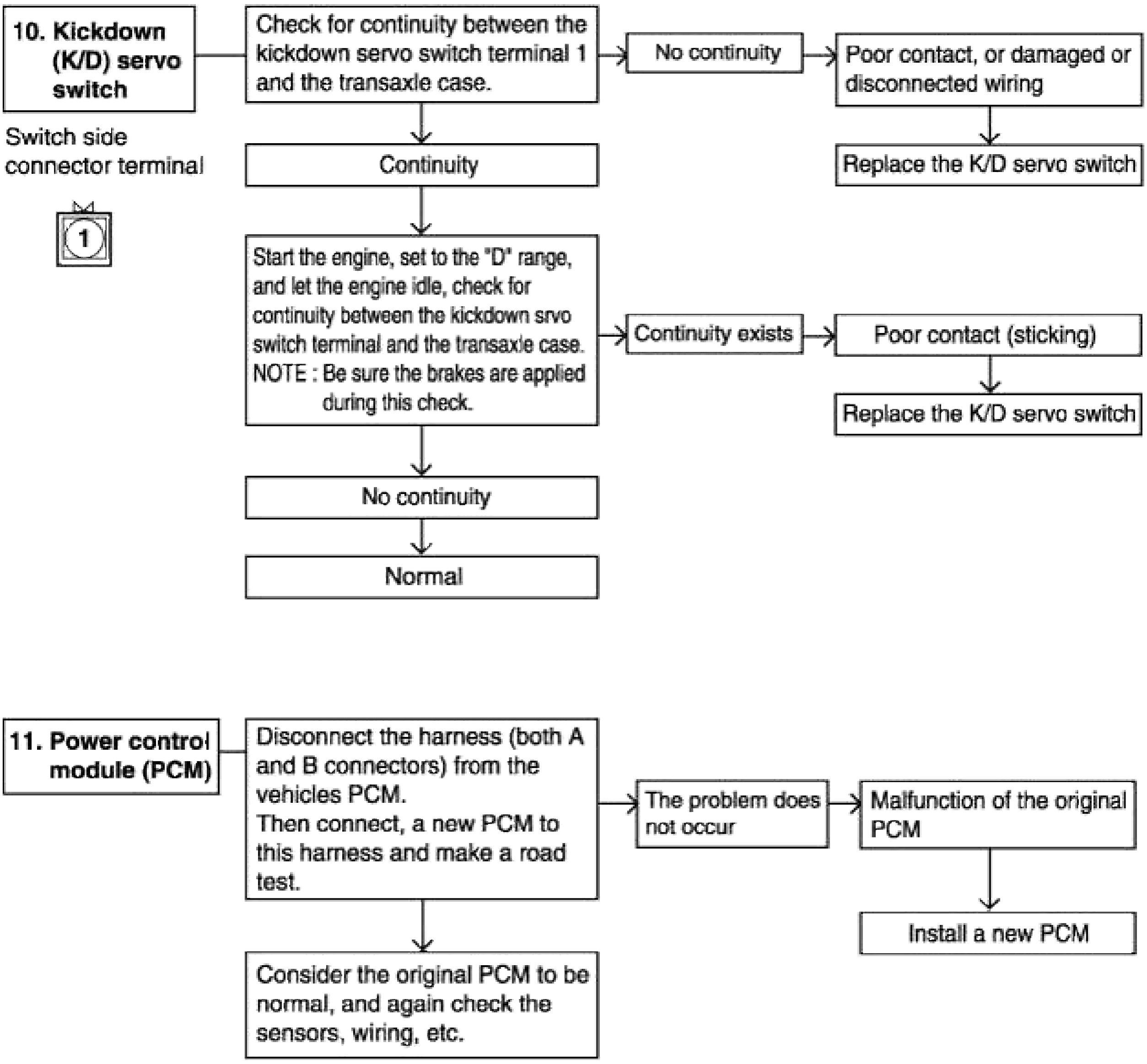

8. Damper clutch control solenoid valve (DCCSV)
Solenoid valve side connector terminal
1
2
3
4
5
6
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
Check the resistance between terminal 6 of the solenoid valve connector and the transaxle case.
Standard value : 3Ω/20°C
Connect 12V between the transaxle case and terminal 6 ; switch ON and OFF and check for operation noise.
Noise exists
Normal
Resistance ; too low or too high
Short-circuit, damaged or disconnected wiring
Replace the DCCSV
No operation noise. Check for sticking. * (Valve stroke : 0.3 mm (0.012 in. or less)
*Sticking is usually at the release side.
Short-circuit, damaged or disconnected wiring.
Replace the DCCSV

9. Transaxle range switch

Switch side connector terminal


1
2
3
4
5
6
7
8
9
10
11
12

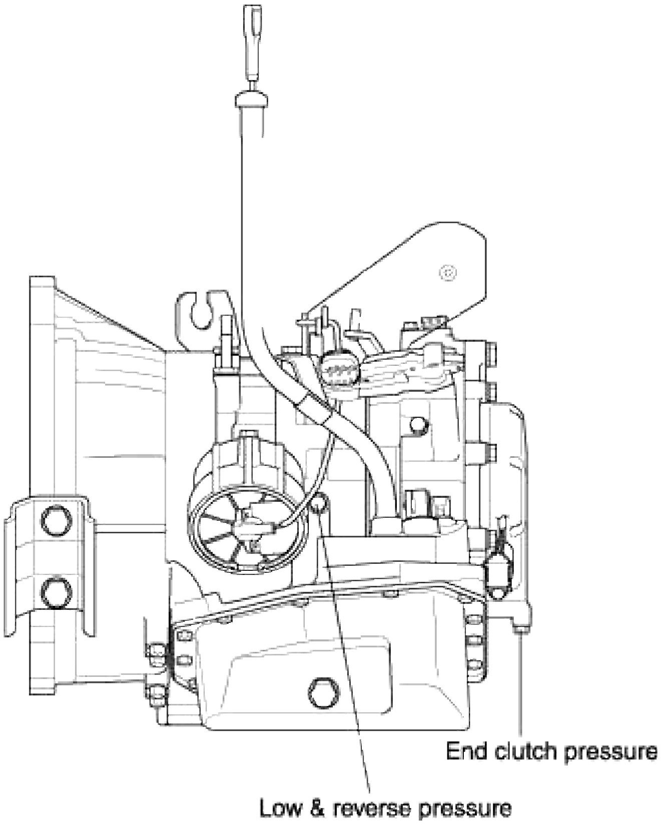

In the "P" range, check for continuity between terminals 8 and 7, and terminals 6 and 9.
Continuity exists
In the "R" range, check for continuity between terminals 6 and 10, and terminals 3 and 5.
Continuity exists
In the "N" range, check for between terminals 7 and 8, and terminals 6 and 12.
Continuity exists
In the 'D' range, check for continuity between terminals 6 and 11.
Continuity exists
In the "2" range, check for continuity between terminals 6 and 4.
Continuity exists
In the "L" range, check for continuity between terminal 2 and 6.
Continuity exists
Normal
No continuity
Poor contact, damaged or disconnected wiring
Replace the transaxle range switch


10. Kickdown (K/D) servo switch
Switch side connector terminal
1
Check for continuity between the kickdown servo switch terminal 1 and the transaxle case.
No continuity
Poor contact, or damaged or disconnected wiring
Replace the K/D servo switch
Continuity
Start the engine, set to the "D" range, and let the engine idle, check for continuity between the kickdown srvo switch terminal and the transaxle case.
NOTE : Be sure the brakes are applied during this check.
Continuity exists
Poor contact (sticking)
Replace the K/D servo switch
No continuity
Normal
11. Power control module (PCM)
Disconnect the harness (both A and B connectors) from the vehicles PCM.
Then connect, a new PCM to this harness and make a road test.
The problem does not occur
Malfunction of the original PCM
Install a new PCM
Consider the original PCM to be normal, and again check the sensors, wiring, etc.

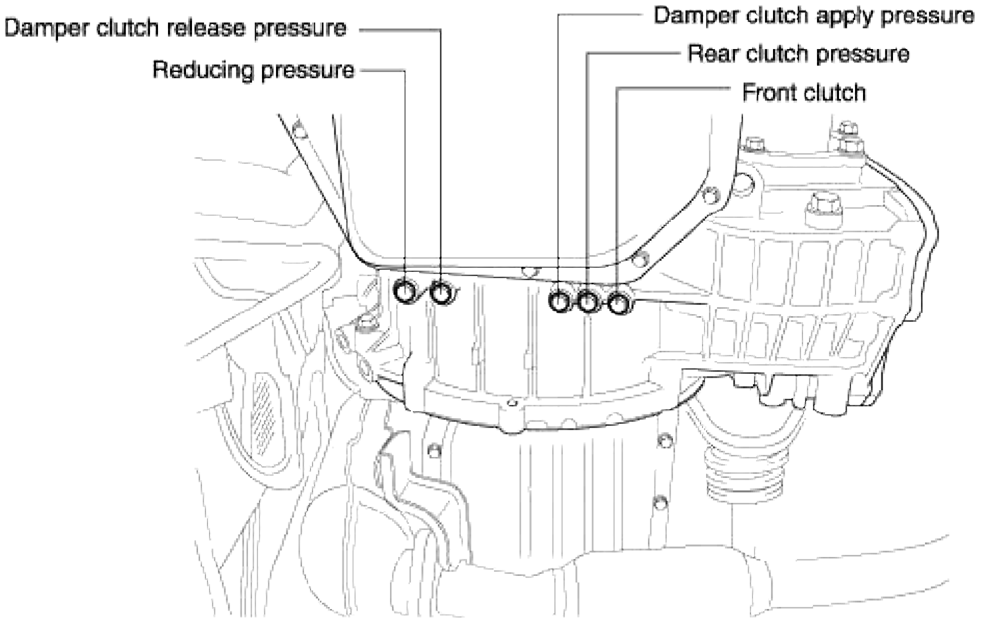
OIL PRESSURE TESTS

1. Completely warm up the transaxle.
2. Raise the front of the vehicle so that the front wheels can be rotated.
3. Connect an engine tachometer and place it in a position where it's easy to see.

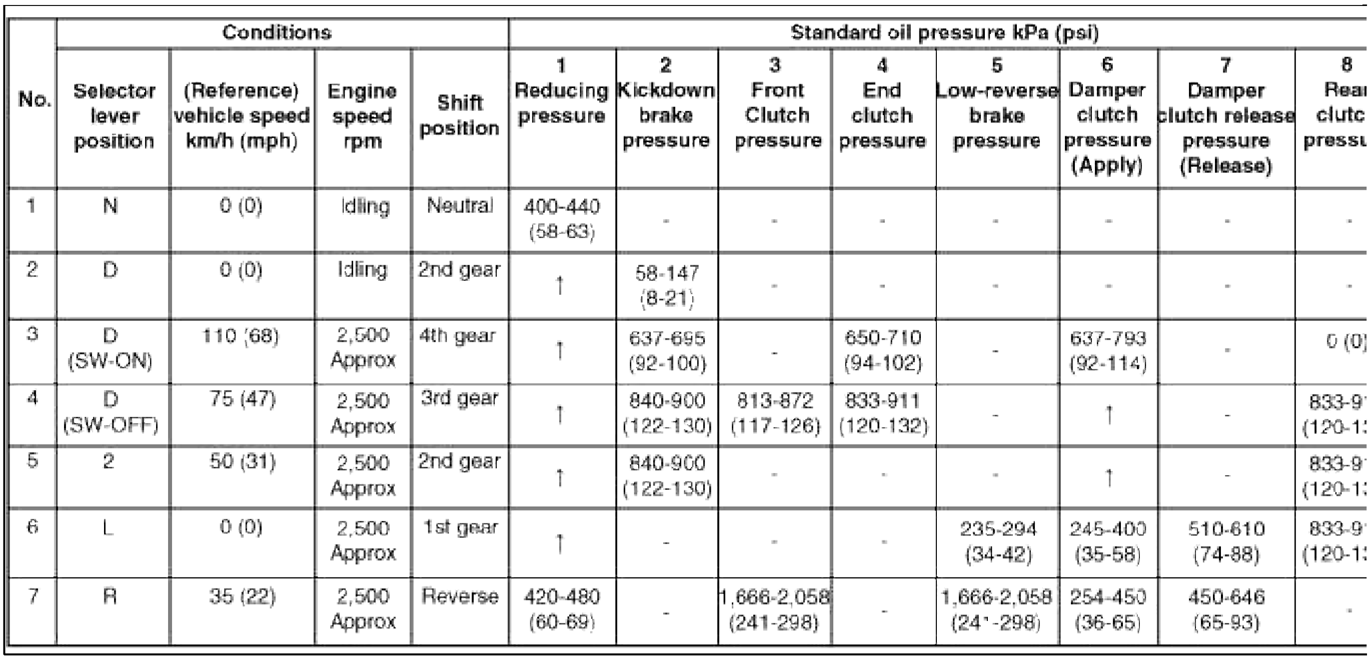
4. Attach the special oil-pressure gauge (09452-21500) and the adapter (09452-21002) to each oil-pressure outlet port.
   When the reverse pressure is to be tested, the 3,000 kpa (400 psi) type of gauge should be used.


End clutch pressure
Low & reverse pressure

5. Measure the oil pressure under various conditions. Check to be sure that the measured results are within the stand value range shown in the "Standard oil pressure table" below. If the oil pressure is not within the specified range, check and repair as described in the section "Preliminary Steps if Oil Pressure Is Not Normal" on the next page.


Damper clutch release pressure
Reducing pressure
Damper clutch apply pressure
Rear clutch pressure
Front clutch

STANDARD OIL PRESSURE TABLE



No.	Conditions				Standard oil pressure kPa (psi)							
	Selector lever position	(Reference) vehicle speed km/h (mph)	Engine speed rpm	Shift position	1 Reducing pressure	2 Kickdown brake pressure	3 Front Clutch pressure	4 End clutch pressure	5 Low-reverse brake pressure	6 Damper clutch pressure (Apply)	7 Damper clutch release pressure (Release)	8 Rea clutc pressu
1	N	0 (0)	Idling	Neutral	400-440 (58-63)	-	-	-	-	-	-	-
2	D	0 (0)	Idling	2nd gear	↑	58-147 (8-21)	-	-	-	-	-	-
3	D (SW-ON)	110 (68)	2,500 Approx	4th gear	↑	637-695 (92-100)	-	650-710 (94-102)	-	637-793 (92-114)	-	0 (0)
4	D (SW-OFF)	75 (47)	2,500 Approx	3rd gear	↑	840-900 (122-130)	813-872 (117-126)	833-911 (120-132)	-	↑	-	833-9 (120-1
5	2	50 (31)	2,500 Approx	2nd gear	↑	840-900 (122-130)	-	-	-	↑	-	833-9 (120-1
6	L	0 (0)	2,500 Approx	1st gear	↑	-	-	-	235-294 (34-42)	245-400 (35-58)	510-610 (74-88)	833-9 (120-1
7	R	35 (22)	2,500 Approx	Reverse	420-480 (60-69)	-	1,666-2,058 (241-298)	-	1,666-2,058 (241-298)	254-450 (36-65)	450-646 (65-93)	-

NOTE

- must be 19.6 kPa (2.8 psi) or less.

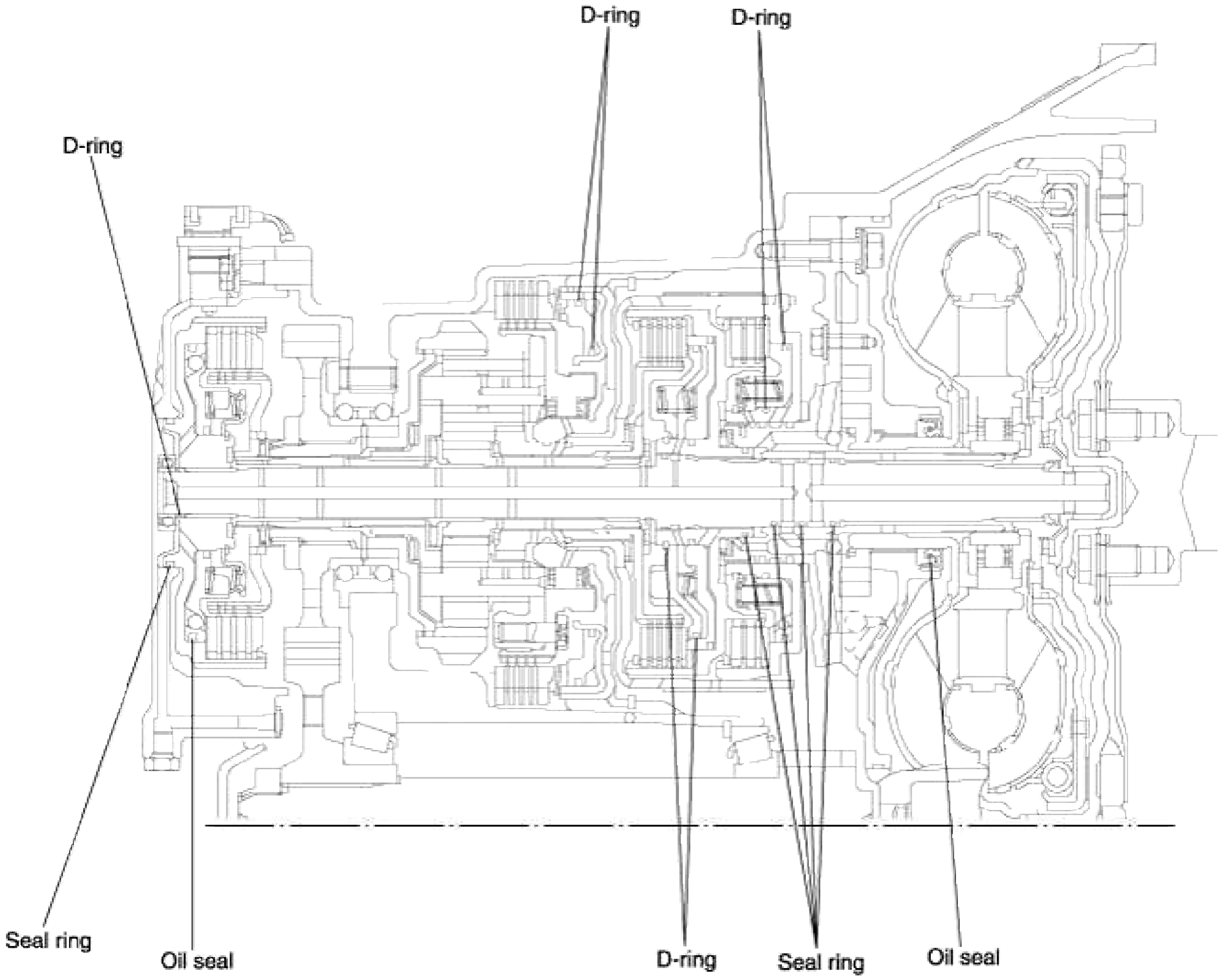
PRELIMINARY STEPS IF OIL PRESSURE IS NOT NORMAL

Trouble symptom	Probable cause	Remedy
Line pressures are all low (or high). Line pressure refers to oil pressures 2, 3, 4, 5, 6, 7 and 8 in the "Standard oil pressure table" on the previous page.	• Obstructed oil filter • Improper adjustment of oil pressure (line pressure) regulator valve • Sticking of regulator valve • Looseness of valve body tightening part • Improper oil pump discharge pressure	• Visually inspect the oil filter; replace the oil filter if it is restricted. • Measure line pressure 2 (kickdown brake pressure); if the pressure is notthe standard value, readjust the line pressure, or if necessary, replace thevalve body assembly. • Check the operation of the regulator valve; repair if necessary, or replacethe valve body assembly. • Tighten the valve body tightening bolt and installation bolt. • Check the side clearance of the oil pump gear; replace the oil pump assembly if necessary.
Improper reducing pressure	• Improper line pressure • Clogging of the filter (L-shaped type) of the reducing-pressure circuit • Improper adjustment of the reducing pressure • Improper adjustment of the reducing pressure • Sticking of the reducing valve • Looseness of valve body	• Check the 2 kickdown brake pressure (line pressure); if the line pressure is not the standard value, check as described in item 1 above. • Disassemble the valve body assembly and check the filter; replace the filter if it is restricted. • Measure the 1 reducing pressure; if it is not the standard value, readjust, or replace the valve body assembly.

	Looseness of valve body tightening part	• Check the operation of the reducing valve; if necessary, repair it, or replace the valve body assembly. • Tighten the valve body tightening bolt and installation bolt.
Improper kickdown brake pressure	• Malfunction of the D ring or seal ring or the sleeve or kickdown servo piston. • Looseness of valve body tightening part. • Functional malfunction of the valve body assembly.	• Disassemble the kickdown servo and check whether the seal ring or D-ring is damaged. If it is cut or has scratches, replace the seal ring or D-ring. • Tighten the valve body tightening bolt and installation bolt. • Replace the valve body assembly.
Improper front clutch pressure	• Malfunction of the D-ring of the sleeve or kickdown servo piston. • Looseness of valve body tightening part • Malfunction of the valve body assembly. • Wear of the front clutch piston or retainer, or malfunction of the D-ring. (Refer to the figure on the next page.) • Oil pump gasket or seal ring (2) damaged.	• Disassemble the kickdown servo and check whether the seal ring is damaged.If it is cut or has scratches, replace the seal ring or D-ring. • Tighten the valve body tightening bolt and installation bolt. • Replace the valve body assembly. • Disassemble the transaxle itself and check whether or not there is wear of the front clutch piston and retainer inner circumference, or damage of the D-ring. If there is any wear or damage, replace the piston, retainer, D-ring and or seal ring.
Improper end clutch pressure	• Malfunction of a D-ring, seal ring of the end clutch or O-ring of the pipe (Refer to the figure on the next page.) • Looseness of valve body tightening part. • Malfunction of the valve body assembly	• Disassemble the end clutch and check the seal ring, D-ring of the piston, seal ring of the retainer, etc.; replace if there are cuts, scars, scratcher or damage. • Tighten the valve body tightening bolt and installation bolt. • Replace the valve body assembly.
Improper low-reverse brake pressure	• O-ring between valve body and transaxle damaged or missing • Looseness of valve body tightening part • Malfunction of the valve body assembly • Malfunction of the O-ring of the low-reverse brake piston or the O-ring of the retainer (Refer to the figure on the next page.)	• Remove the valve body assembly and check to be sure that the O-ring at the upper surface of the upper valve body is not missing or damaged; install or replace the O-ring if necessary. • Tighten the valve body tightening bolt and installation bolt. • Replace the valve body assembly. • Disassemble the transaxle itself and check the O-ring for damage; replace if there are cuts, scars, scratches or damage.

Improper torque converter pressure	• Sticking of the damper clutch control solenoid valve (DCCSV) • Clogging or leaking of the oil cooler and/or lines. • Damaged seal ring of the input shaft. • Malfunction of the torque converter.	• Check the operation of the damper clutch system and the DCCSV. • Repair or replace, as necessary, the cooler and/or lines. • Disassemble the transaxle itself and check for damage of the seal ring; replace the seal ring if there is damage. • Replace the torque converter.
Improper rear clutch pressure	• Malfunction of the D-ring or seal ring of the rear clutch. • Looseness of valve body tightening part. • Functional malfunction of the valve body assembly.	• Tighten the value body tightening bolt and installation bolt. • Replace the valve body assembly.
Improper damper clutch release pressure.	Same as the probable cause of damper clutch release pressure	Same as the remedy of damper clutch release pressure.

SEAL INSTALLATION


D-ring
D-ring
D-ring
Seal ring
Oil seal
D-ring
Seal ring
Oil seal

CONVERTER STALL TEST

A stall test determines the maximum engine speed obtained at full throttle in "D" and "R" range. This test checks the torque converter stator overrunning clutch operation, and the holding ability of the transaxle clutches and the low-reverse brake.

WARNING

During this test, make sure that nobody stands in front of or behind the vehicle.

1. Check transaxle fluid level. Fluid should be at normal operating temperature [80~90°C (176~194°F)]. Engine coolant should also be at normal operating temperature [80~90°C (176~194°F)].

2. Apply chocks to both rear wheels.
3. Attach an engine tachometer.
4. Apply the parking and service brakes fully.
5. Start the engine.
6. With the selector lever in the "D" position, depress the accelerator pedal fully to read maximum engine rpm. Do not hold the throttle wide open any longer than is necessary to obtain maximum engine rpm reading, and never longer than 5 seconds at a time. If more than one stall test is required, operate the engine at approximately 1,000 rpm in neutral for 2 minutes to cool the transaxle fluid between tests.

   Stall speed: 2,200~2,800rpm

7. Place the selector lever in the "R" position and perform the stall test by the same procedure as previously described.

STALL SPEED ABOVE SPECIFICATION IN "D"

If stall speed is higher than specification, the rear clutch or overrunning clutch of the transaxle is slipping. In this case, perform a hydraulic test to locate the cause of slippage.

STALL SPEED ABOVE SPECIFICATION IN "R"

If the stall speed is higher than specification, the front clutch of the transaxle or low-reverse brake is slipping. In this case, perform a hydraulic test to locate the cause of slippage.

STALL SPEED BELOW SPECIFICATION IN "D" AND "R"

If the stall speed is lower than specification, insufficient engine output or a faulty torque converter is suspected. Check for engine misfiring, improper ignition timing, or valve clearance etc. If these are good, the torque converter is faulty.

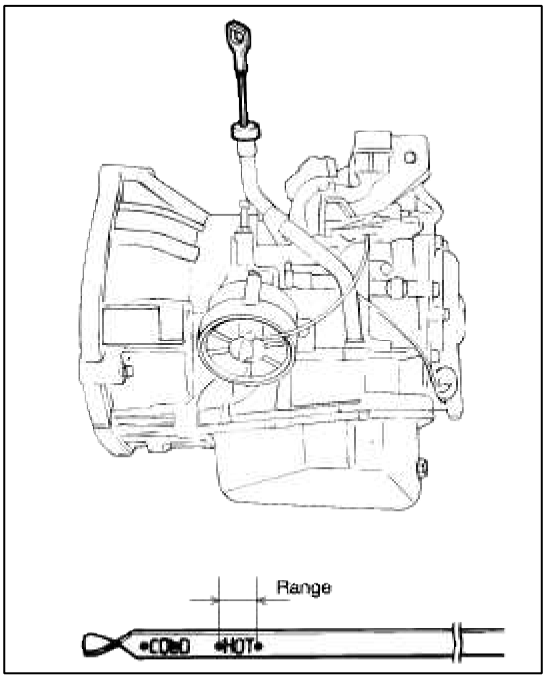
TRANSAXLE FLUID LEVEL INSPECTION

1. Drive the vehicle until the fluid reaches normal operating temperature [80~90°C (176~194°F)].
2. Place the vehicle on a level surface.
3. Move the selector lever through all gear positions. This will fill the torque converter and hydraulic system with fluid, then place lever in "N" (Neutral) position.
4. Before removing the dipstick, wipe all contaminants from around the dipstick. Then take out the dipstick and check the condition of the fluid. The transaxle should be overhauled under the following conditions.
   A. If there is a "burning" door.
   B. If the fluid color has become noticeably black.
   C. If there is a noticeably excessive amount of metal particles in the fluid.
5. Check to see if the fluid level is in the "HOT" range on dipstick. If fluid level is low, add automatic transaxle fluid until the level reaches the "HOT" range.

   Transaxle fluid: DIAMOND ATF SP-III, SK ATF SP-III

   Low fluid level can cause a variety of abnormal conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic system forms bubbles which are compressable. Therefore, pressures will be erratic, causing delayed shifting, sliping clutches and brakes, etc. Improper filling can also raise fluid level too high. When the transaxle has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transaxle fluid. In either case, air bubbles can cause overheating, and fluid oxidation, which can interfere with normal valve, clutch, and servo operation. Foaming can also result in fluid escaping from the transaxle vent where it may be mistaken for a leak.

6. Be sure to examine the fluid on the dipstick closely.



NOTE

When new, automatic transmission fluid should be red. The red dye is added so distinguish it from engine oil or antifreeze. As the vehicle is driven the transmission fluid will begin to look darker. The color may eventually appear light brown.
Also, the dye, which is not an indicator of fluid quality, is not permanent.
Therefore, further investigation of the automatic transaxle is required if,

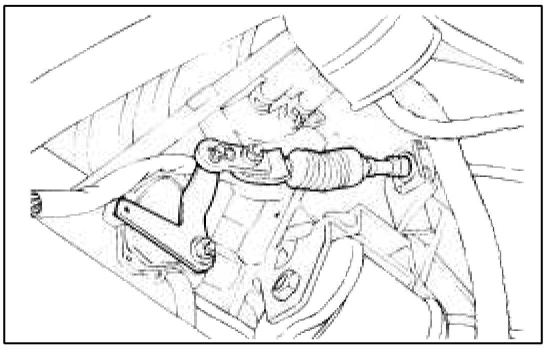
- the fluid is dark brown or black.
- the fluid smells burnt.
- metal particles can be seen or felt on the dipstick.

SELECTOR LEVER OPERATION CHECK

1. Shift the selector lever to each range and check to see that the lever moves smoothly and is controlled. Check to see that the position indicator is correct.
2. Check to be sure that the selector lever can be shifted to each position.
3. Start the engine and check to see if the vehicle moves forward when the selector lever is shifted from "N" to "D" and moves backward when shifted to "R".
4. When the shift lever malfunctions, adjust the control cable and the selector lever sleeve. Check for worn shift lever assembly sliding parts.

TRANSAXLE RANGE SWITCH ADJUSTMENT

1. Place selector lever in "N" (Neutral) position.
2. Loosen the manual control lever lock nut to seperate the cable and lever.



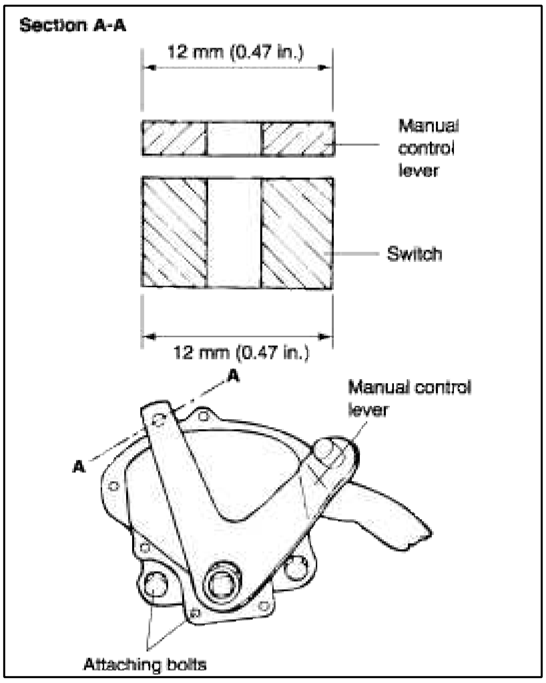
3. Place the manual control lever in the "N" (Neutral) position.

4. Turn the transaxle range switch body until the 12 mm (0.47 in.) wide end of the manual control lever aligns with the switch body flange [12 mm (0.472 in.) wide portion].
5. Tighten the attaching bolts (2 pcs.) to the specified torque.

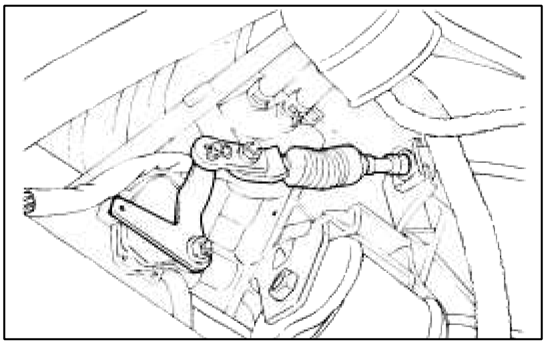
Transaxle Range Switch Attaching Bolt:
10~12 Nm (100~120 kg·cm, 7~9 lb·ft)

NOTE

When setting up the switch body, be careful that the O-ring does not drop from the switch body. Tighten the attaching bolts carefully.



6. Make sure that the selector lever is in the "N" (Neutral) position.
7. Adjust the flange nut so that there is no slack in the control cable and make sure that the selector lever operates smoothly.
8. Run the vehicle and confirm that the transaxle is set in each range when the selector lever is shifted to each position.



KICKDOWN SERVO ADJUSTMENT

1. Completely remove all dirt and other contaminating materials adhered around the kickdown adjust screw.
2. Loosen the lock nut.
3. Loosen and tighten the adjust screw two times by torque of 5 Nm (3.6 lb·ft)
4. Tighten adjust screw by torque of 5 Nm and then, loosen the adjust screw 3 to 3-1/3 turns.

5. Tighten the lock nut to the specified torque.

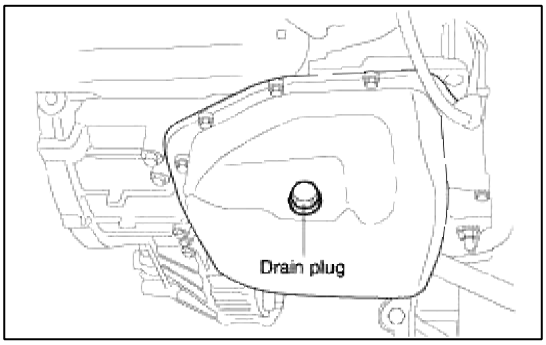
Lock nut: 15~22 Nm (150~220 kg·cm, 11~16 lb·ft)

NOTE

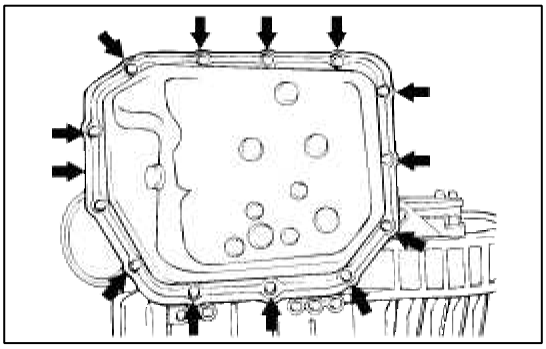
Before assembling, apply sealant (DC780) to the center portion of the adjust screw.

LINE PRESSURE ADJUSTMENT

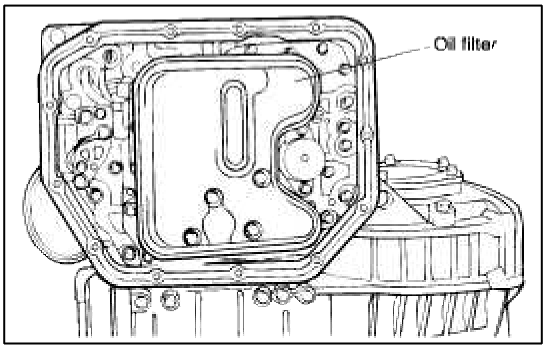
1. Drain out the automatic transaxle fluid.



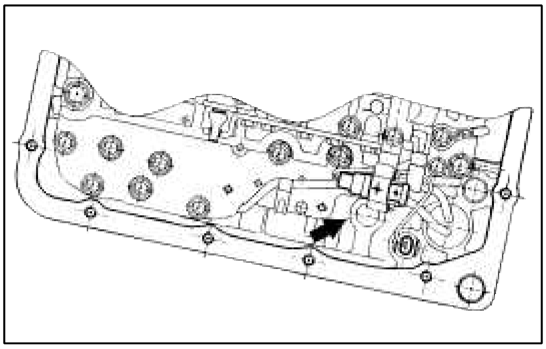
2. Remove the oil pan.



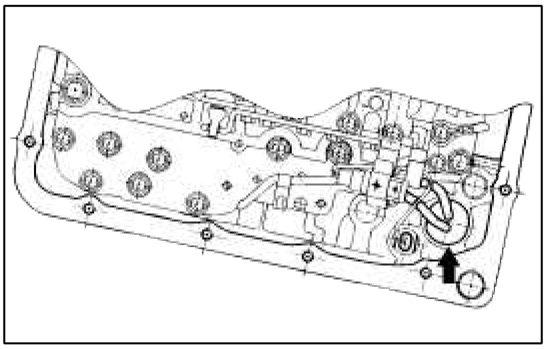
3. Remove the oil filter.



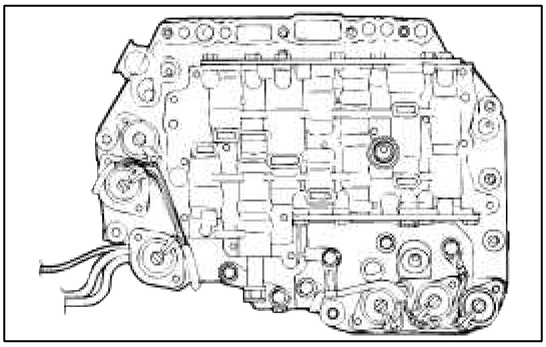
4. Remove the oil-temperature sensor.



5. Press the tab of the solenoid valve harness grommet and push in.

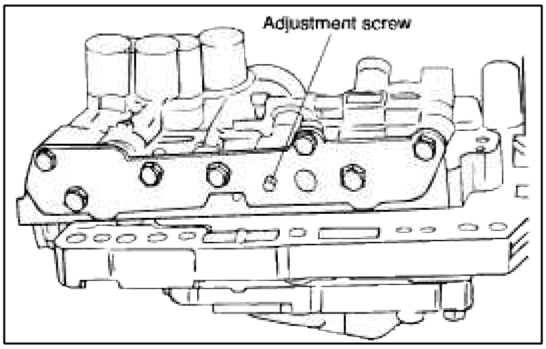


6. Remove the valve body assembly. The manual valve can come out, so be careful not to drop it.

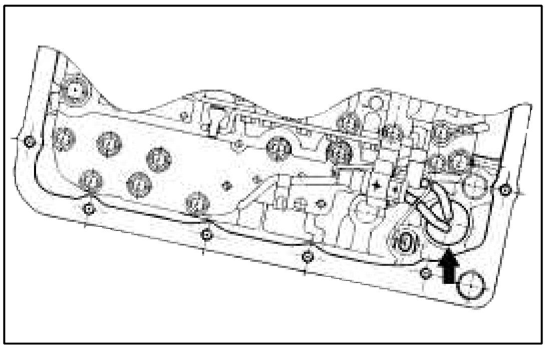


7. Turn the adjustment screw of the regulator valve and adjust so that the line pressure (kickdown brake pressure) reaches the standard value. When the adjustment screw is turned clockwise, the line pressure becomes lower; when it is turned counter-clockwise, it becomes higher.

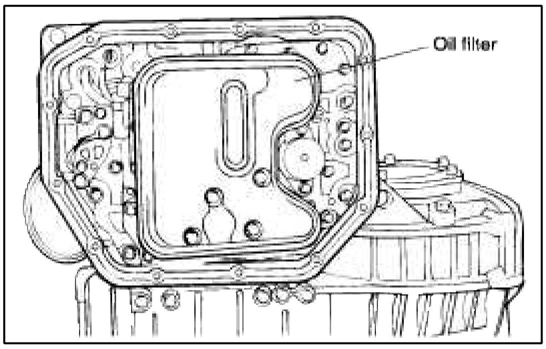
Standard value:
860~900 kPa (122~129 psi, 8.77~9.18 kg/cm²)
Oil pressure change for each turn of adjustment screw:
38 kPa (5.4 psi, 0.39 kg/cm²)



8. Check to be sure that the O-ring is installed on the upper surface of the valve body in it's proper place.
9. Replace the O-ring of the solenoid valve connector with a new one.
10. Install the valve body assembly to the case and then insert the solenoid valve connector into the case. Be sure, at this time, that the notched part of the connector faces as shown in the figure. Also be careful that the lead wiring isn't caught.



11. Tighten the valve body assembly mounting bolts to 10-12 Nm (100-120 kg·cm, 7-9 lb·ft).
12. Install the oil filter.



13. Install a new oil pan gasket with the oil pan.
14. Add the specified amount of automatic transaxle fluid.
15. Perform the oil pressure test. Readjust if necessary.

REDUCING PRESSURE ADJUSTMENT

If the Scan Tool is not abailable

1. Remove parts up to the oil filter in the same way as for adjustment of the line pressure. The valve body need not be removed.
2. Turn the adjustment screw of the lower valve body and adjust so that the reducing pressure is the standard value. When the adjustment screw is turned clockwise, the reducing pressure becomes lower; when it is turned counter clockwise, it becomes higher.

NOTE

When adjusting the reducing pressure, aim for the center value (425 kPa, 60 psi) of the standard value allowance.

Standard value:
420 kPa (60 psi, 4.2±0.2 kg·cm²)
Oil pressure change for each turn of the adjustment screw:
22 kPa (4.3 psi, 0.22 kg·cm²)

3. Install the oil filter and oil pan in the same way as for adjustment of the line pressure.
4. Peform the oil pressure test. Readjust if necessary.

If the Scan Tool is used

1. Adjust the pressure control solenoid so that the kickdown brake pressure is the standard value when activated to 50% duty by the Scan Tool.

Standard value:
320±30 kPa (39±1 psi, 3.2±0.3 kg·cm²)
Oil pressure change for each turn of the adjustment screw:
30 kPa (3 psi, 0.3 kg·cm²)

2. Check to be sure that the reducing pressure (after the adjustment is completed) is within the range of 370~490 kPa (53~70 psi, 3.8~5.0 kg·cm²).

CAUTION

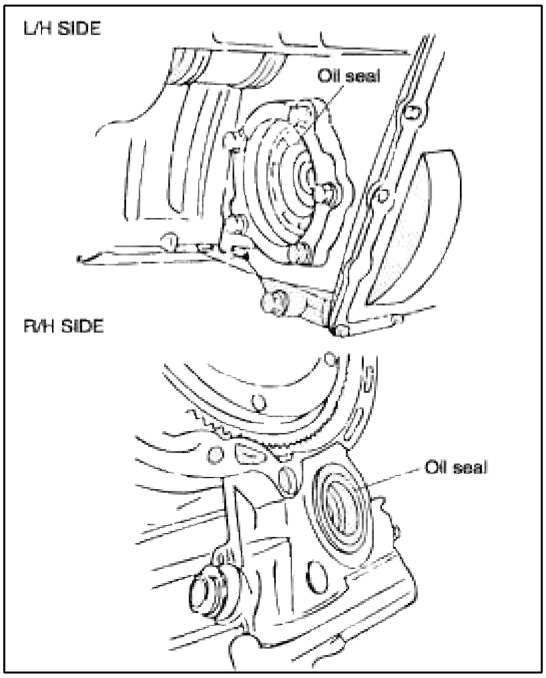
This adjustment should be made with an oil temperature of 80-90°C (176-194°F). If the adjustment is made at a temperature that is too high, the line pressure will drop during idling, with the result that it might not be possible to make the correct adjustment.

THROTTLE POSITION SENSOR INSPECTION

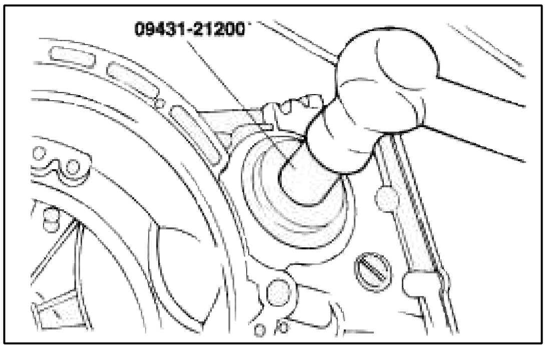
Refer to GROUP FUEL SYSTEM.

DRIVE SHAFT OIL SEALS REPLACEMENT

1. Disconnect the drive shaft from the transaxle. (Refer to DRIVE SHAFT&FRONT AXLE)
2. Using a flat-tip (-) screwdriver, remove the oil seal.



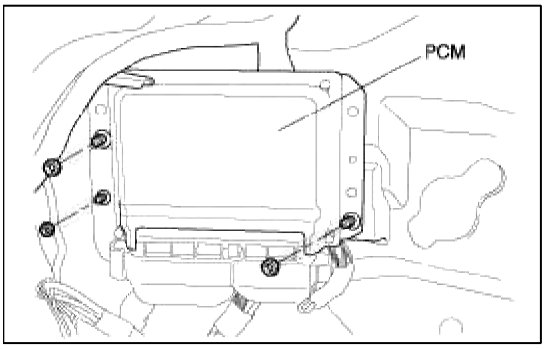
3. Using the special tool (09431-21200), tap the drive shaft oil seal into the transaxle.



4. Apply a coating of the transaxle fluid to the lip of the oil seal.

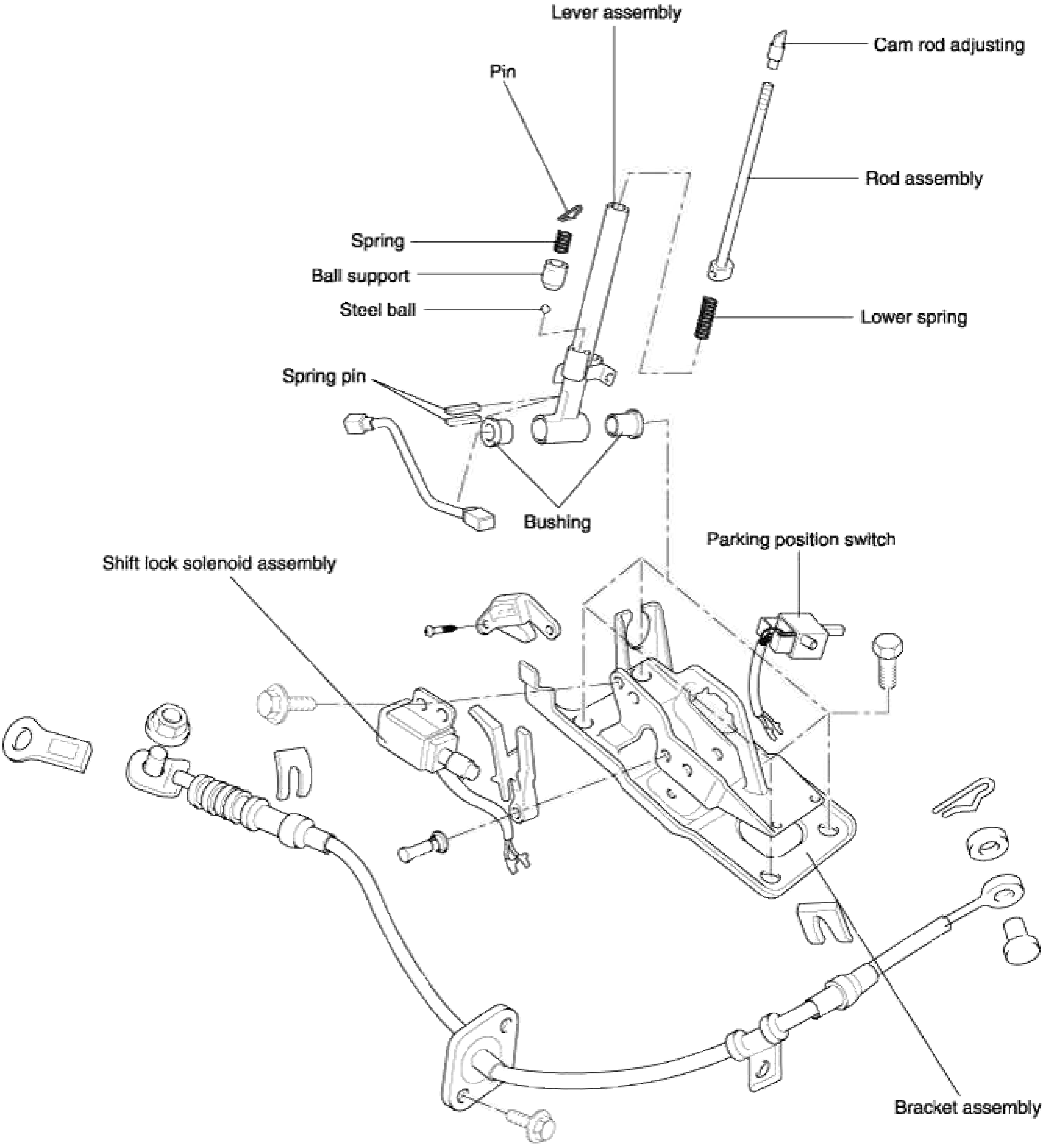
PCM REPLACEMENT

PCM (Power Control Module) is located at the dash panel of the upper side of brake pedal in the driver side.



Automatic Transaxle System > Automatic Transaxle Control System > Shift Lever > Components and Components Location

SHIFT LEVER ASSEMBLY


Lever assembly
Cam rod adjusting
Pin
Rod assembly
Spring
Ball support
Steel ball
Lower spring
Spring pin
Bushing
Parking position switch
Shift lock solenoid assembly
Bracket assembly

Automatic Transaxle System > Automatic Transaxle Control System > Shift Lever > Repair procedures

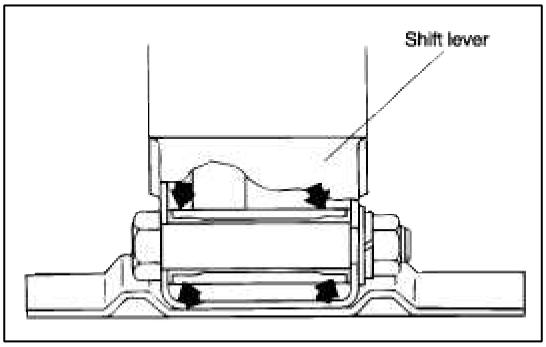
INSPECTION

- Check the detent place for wear.
- Check the bushing for wear or damage.
- Check the spring for damage or deterioration.
- Check the pin at the end of the rod assembly for wear.

REASSEMBLY

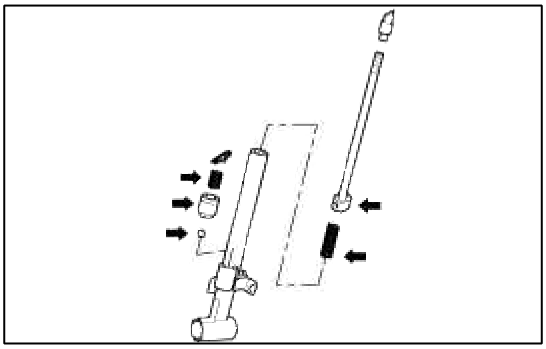
1. Apply a coating of grease to the sliding part of the bushing.

Specified grease:
Chassis grease SAE J310, NLGI No.2



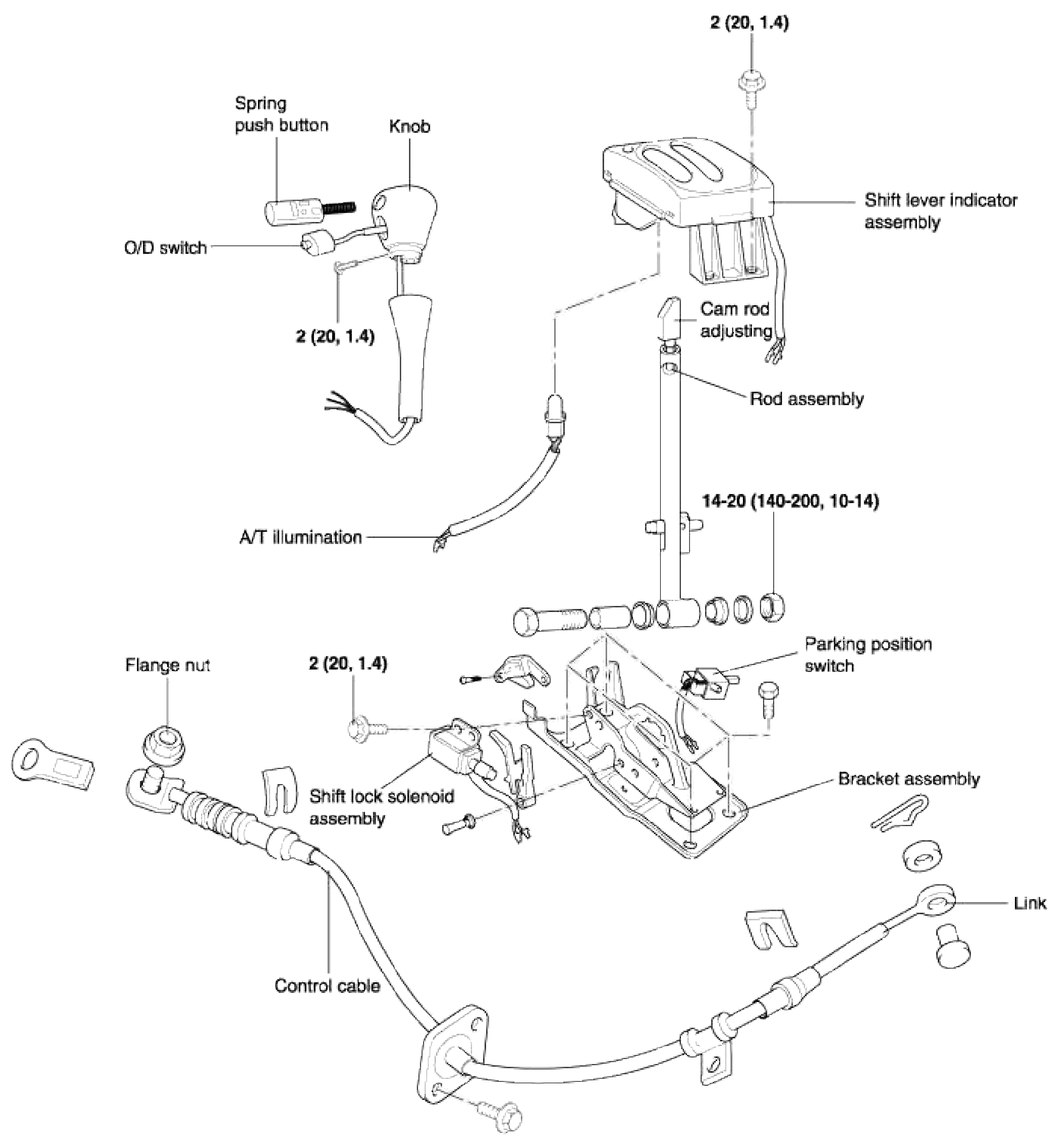
2. Apply the specified grease at the places shown in the figure.

Specified grease:
Multipurpose grease SAE J310, NLGI No.2



Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Shift Control > Components and Components Location

COMPONENTS

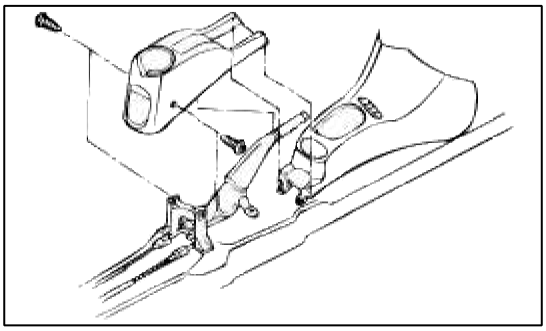

2 (20, 1.4)
Spring push button
Knob
Shift lever indicator assembly
O/D switch
Cam rod adjusting
2 (20, 1.4)
Rod assembly
14-20 (140-200, 10-14)
A/T illumination
Parking position switch
Flange nut
2 (20, 1.4)
Shift lock solenoid assembly
Bracket assembly
Link
Control cable

TORQUE : N·m (kg·cm, lb-ft)

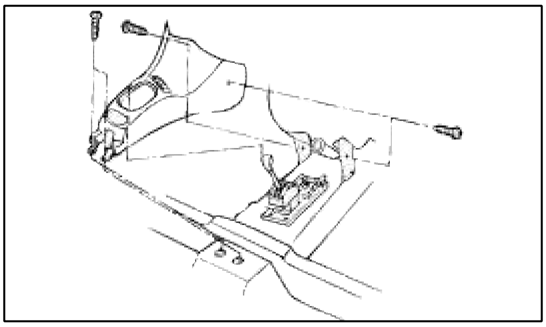
Automatic Transaxle System > Automatic Transaxle Control System > Transaxle Shift Control > Repair procedures

REMOVAL

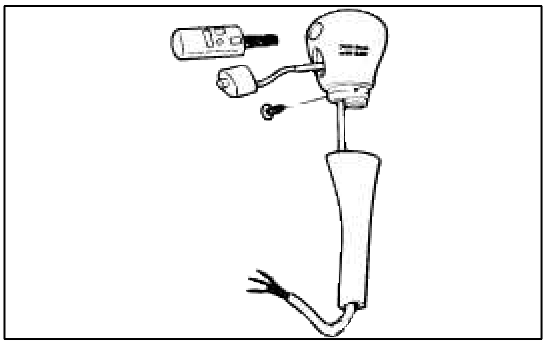
1. Remove the rear console.



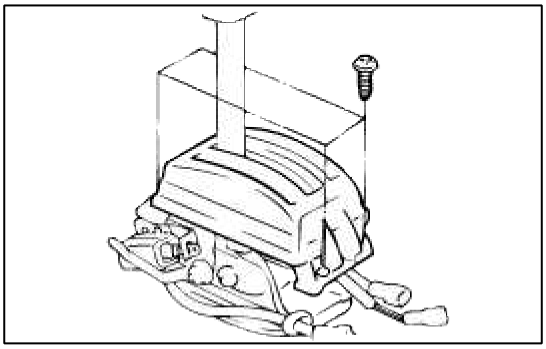
2. Remove the front console.



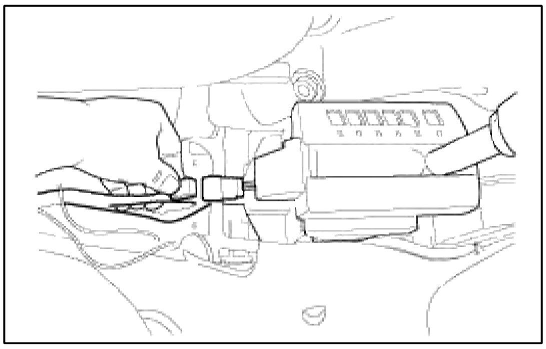
3. Remove the knob installation screws.
4. Disconnect the overdrive switch connector, remove the 3 connector pins from connector with small driver, and then remove selector knob assembly.



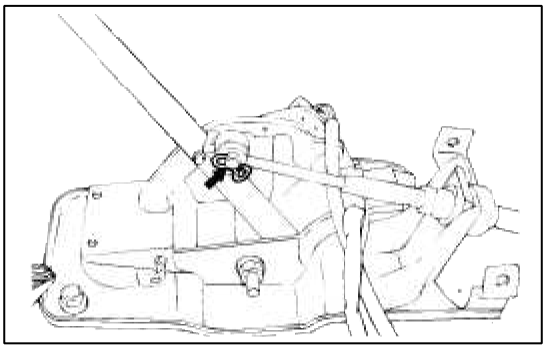
5. Disconnect the position indicator light connector.



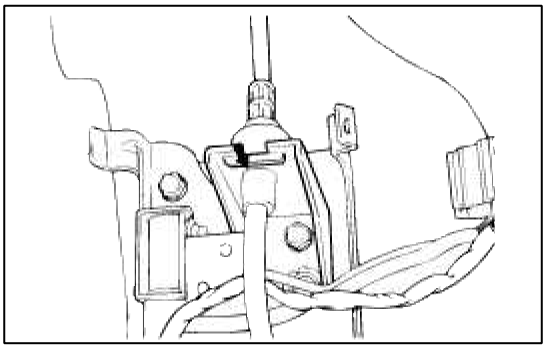
6. Remove the shift lever indicator assembly.



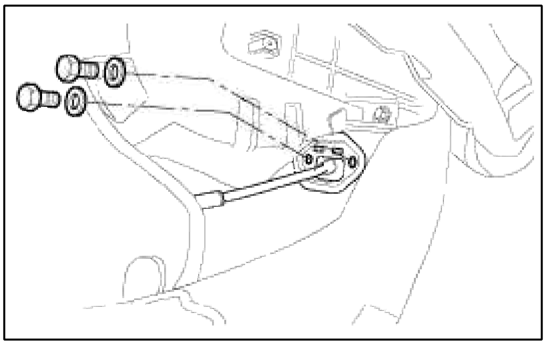
7. Remove the cotter pin.



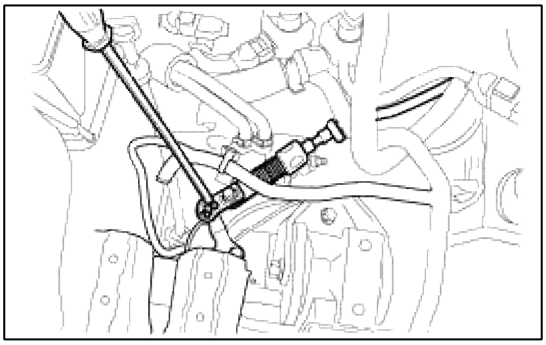
8. Remove the clip from the shift lever side.

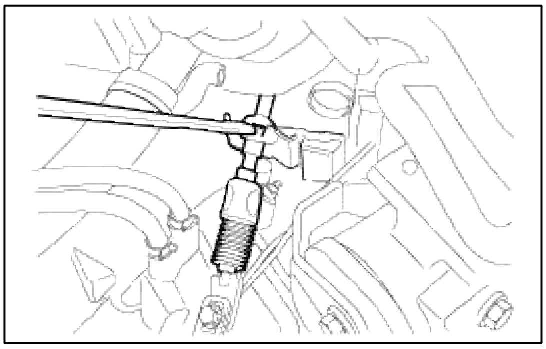


9. Remove the bolt-washer assembly located on dash panel.



10. Remove the shift lever assembly.
11. Remove the transaxle control cable assembly.

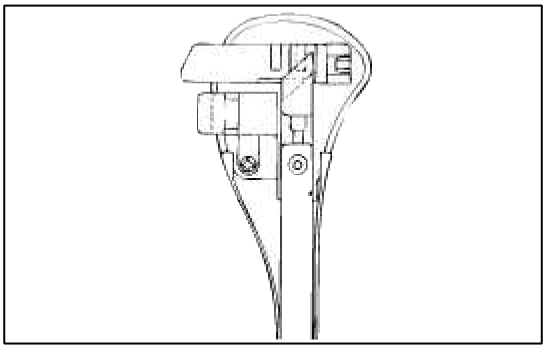




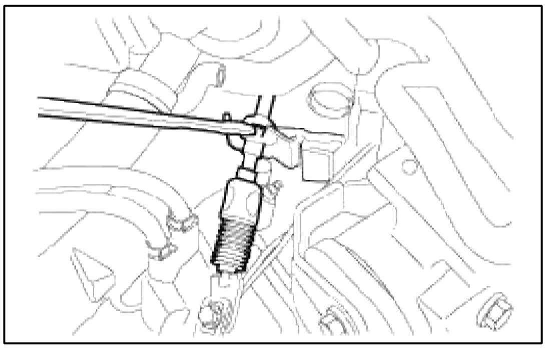
INSTALLATION

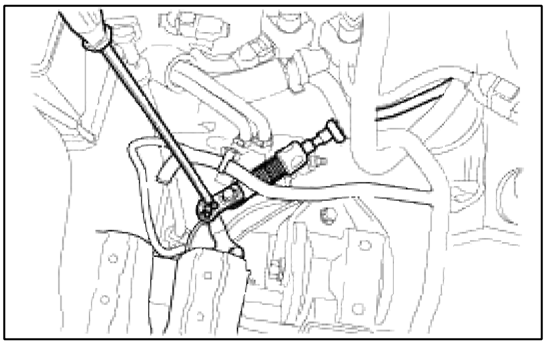
1. Apply a coating of the specified grease to the interior of the bushing.

Specified grease:
Chassis grease SAE J310, NLGI No.0

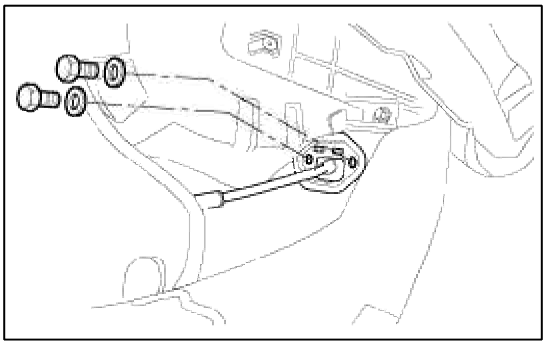


2. Move the shift lever and the transaxle range switch to the N position, and install the control cable.
3. When connecting the control cable to the transaxle mounting bracket, install the clip until it contacts the control cable.

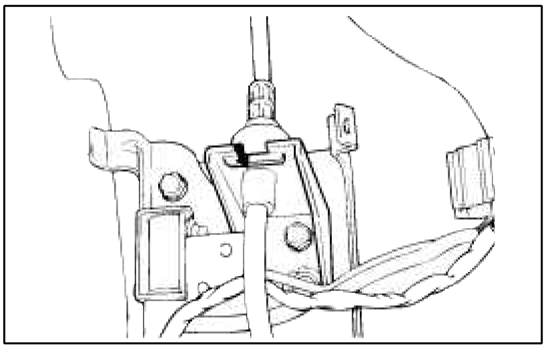




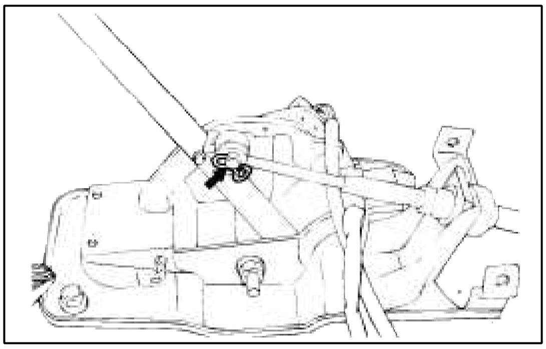
4. Install the bolt-washer assembly and nut.



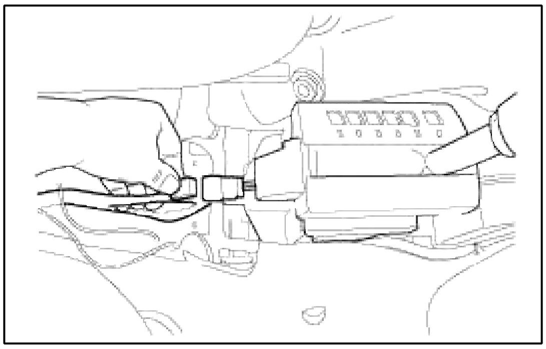
5. Install the clip pin and self lock pin.



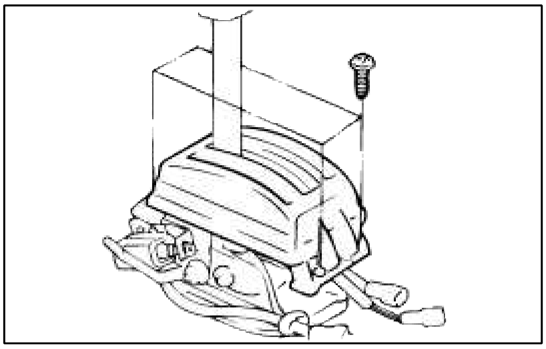
6. Install the cotter pin.



7. Connect the position indicator light connector, the O/D switch connector, the parking position switch connector, normal/economy select switch connector and the shift lock solenoid connector.

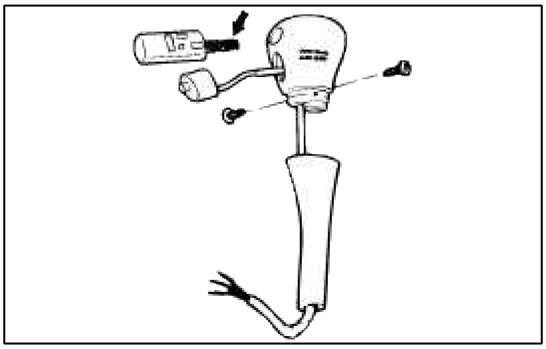


8. Install the shift lever indicator assembly.



9. Apply the specified grease at the place shown in the figure.

Specified grease:
Multipurpose grease SAE J310, NLGI No.2

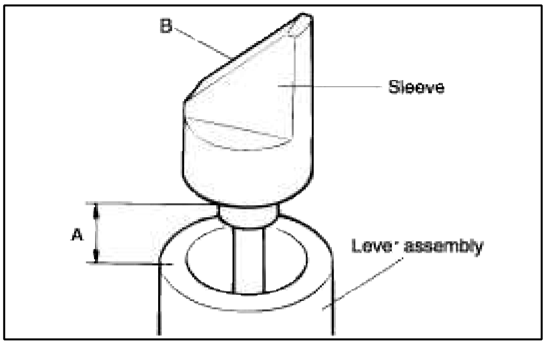


10. Install the shift lever assembly.
11. Place the shift lever in the N position, and then turn the cam adjusting so that the clearance between the cam adjusting and the lever assembly end in within the standard value.

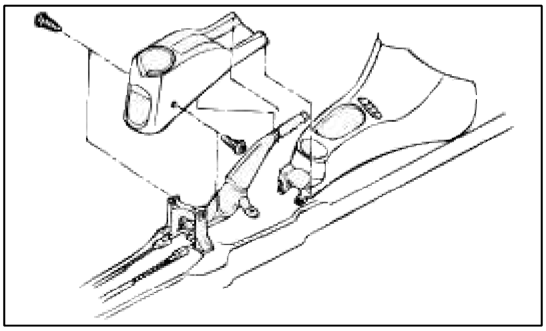
Standard value (A) 15.2-15.9 mm (0.598-0.625 in.)

NOTE

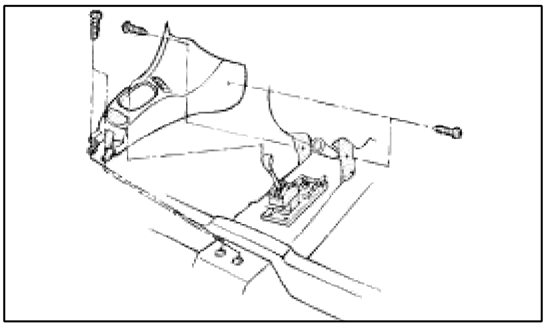
Be sure to face B of the adjusting cam to the push button (driver's side).



12. Insert the O/D switch wiring to the shift lever cover, and then assemble the pin into the O/D switch connector.
13. Install the front console.

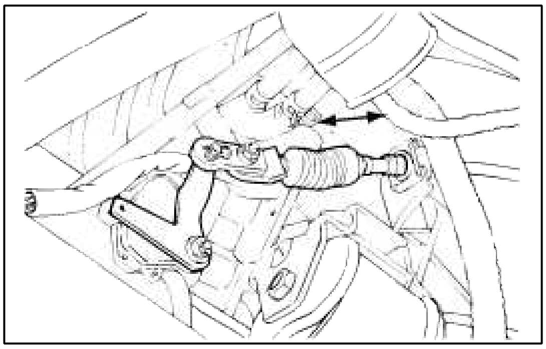


14. Install the rear console.



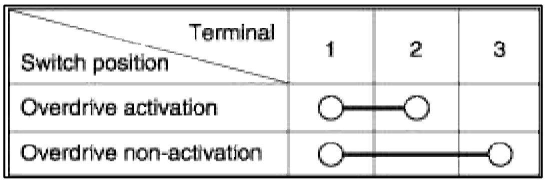
ADJUSTMENT OF CONTROL CABLE

1. Eliminate slack from the control cable with the adjusting flange nut and check that the select lever operates smoothly.
2. Driving the car, check that the transaxle is set in the proper range when the select lever is shifted to each position.



INSPECTION

1. Check the control cable for function and damage.
2. Check the bushing for wear or damage.
3. Check the spring for damage or deterioration.
4. Check the overdrive switch for continuity.



Terminal Switch position	1	2	3
Overdrive activation	○	○	
Overdrive non-activation	○		○

Automatic Transaxle System > Troubleshooting > P0707

DTC TROUBLESHOOTING PROCEDURE

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0707	TRANSAXLE RANGE SWITCH (TR SWITCH)	Open, GND short
P0708		Short

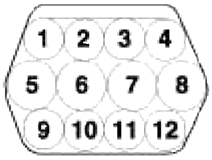
DESCRIPTION

The PCM monitors this voltage, which corresponds to the position of the transaxle gear shift lever to determine desired gear and electronic pressure control pressure. The transaxle range switch is located on the top of the transaxle, and also contains the neutral/start circuit.

TROUBLESHOOTING FLOW

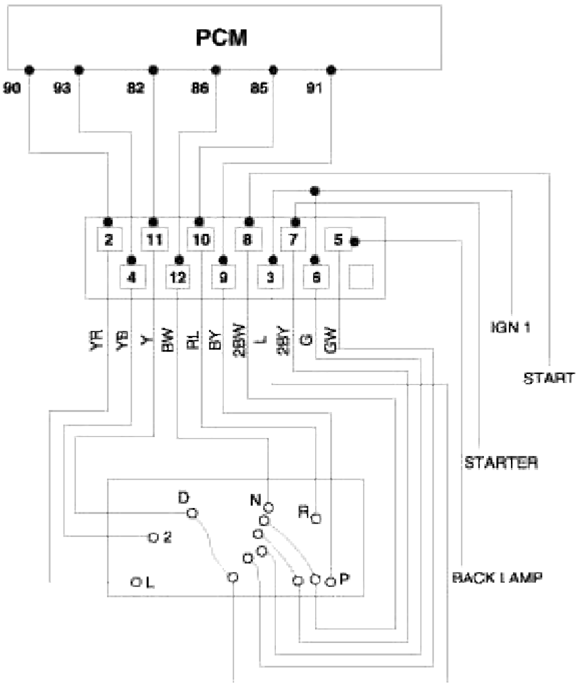
Detection condition	Possible cause	Check item
1. No signal is continuous for > 30 seconds 2. Above 2 signals are continuous for > 30 seconds • Engine speed ≥ 600rpm	• Malfunction of TR switch • Malfunction of connector • Malfunction of PCM	• Harness & connector • Transaxle range switch
SYMPTOM • Starting impossible • Does not move		

CIRCUIT DIAGRAM



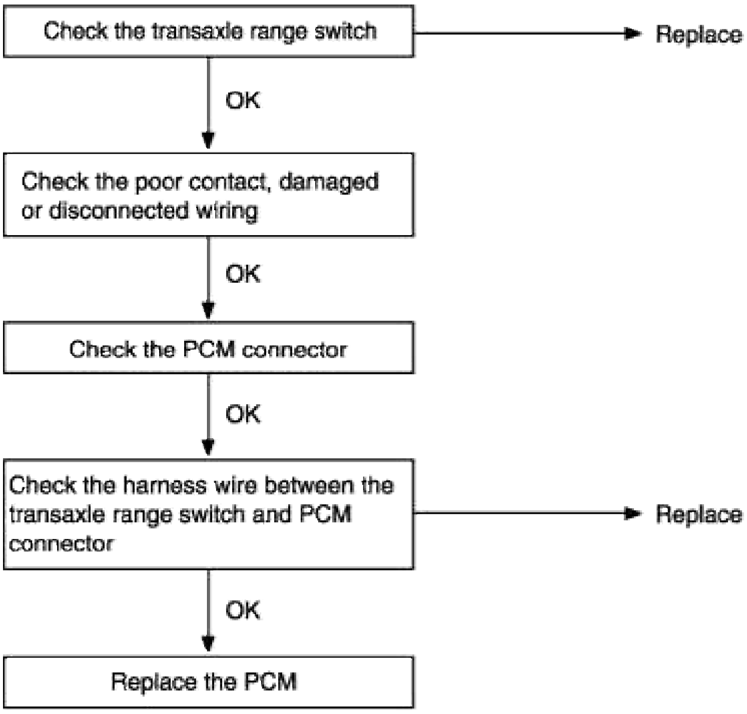
Transaxle range switch connector terminals

1
2
3
4
5
6
7
8
9
10
11
12



PCM
90
93
82
86
85
91
2
11
10
8
7
5
4
12
9
3
6
YR
YB
Y
BW
RL
BY
2BW
L
2BY
G
GW
IGN 1
START
STARTER
BACK LAMP
D
N
R
2
L
P

INSPECTION PROCEDURES


Check the transaxle range switch
Replace
OK
Check the poor contact, damaged or disconnected wiring
OK
Check the PCM connector
OK
Check the harness wire between the transaxle range switch and PCM connector
Replace
OK
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0711

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

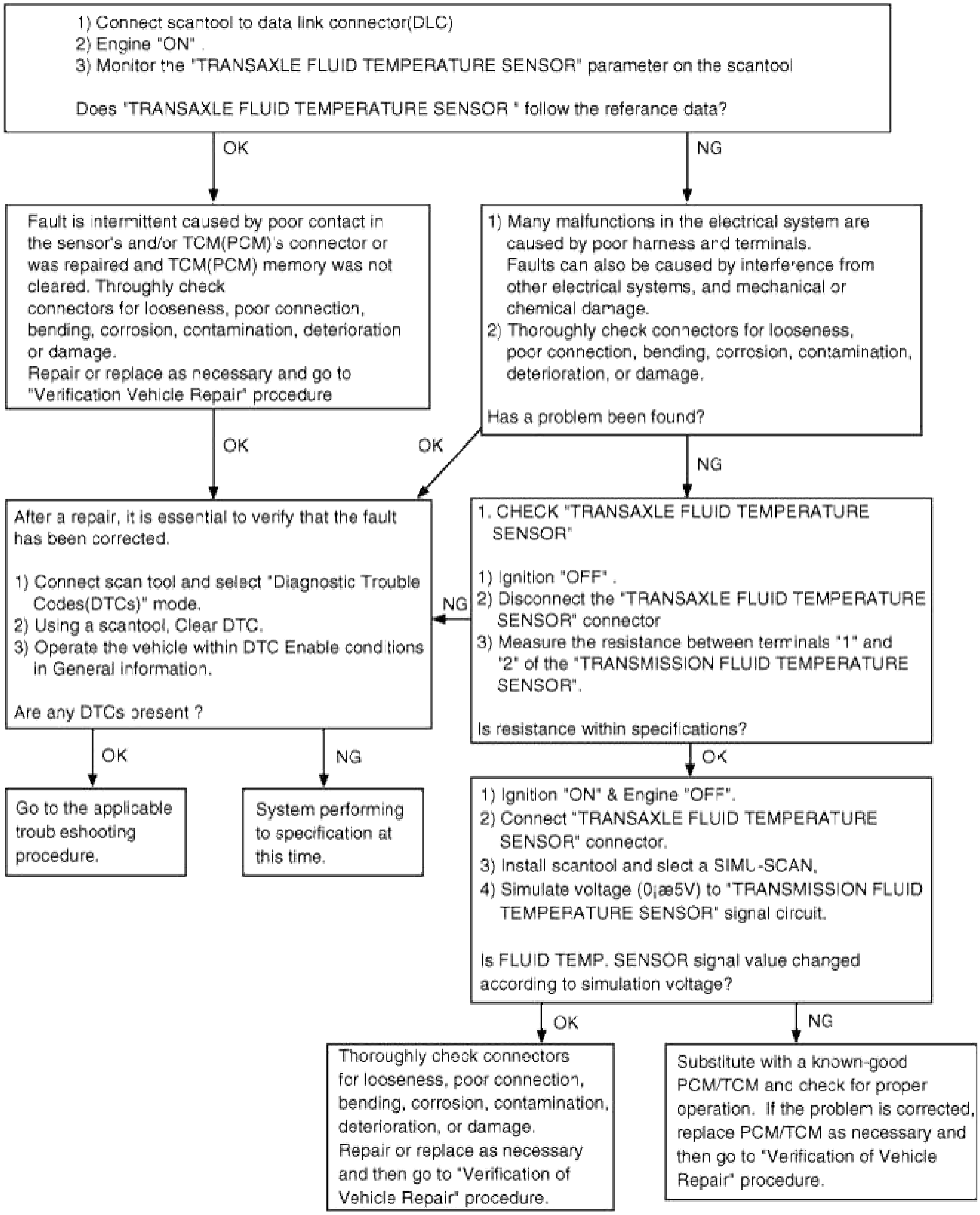
DTC NO	DIAGNOSTIC ITEM	
P0711	FLUID (OIL) TEMPERATURE SENSOR SYSTEM	- Rationality check -

DESCRIPTION

- The automatic TRANSAXLE fluid(ATF) temperature sensor is installed in the Valve Body. This sensor uses a thermistor whose resistance changes according to the temperature changes. The TCM supplies a 5V reference voltage to the sensor, and the output voltage of the sensor changes when the ATF temperature varies. The automatic TRANSAXLE fluid(ATF) temperature provides very important data for the TCM's control of the Torque Converter Clutch, and is also used for many other purposes.

TROUBLESHOOTING GUIDE

Detection condition		Possible cause	Check item
Malfunction Criteria	**Threshold Value**		
• Stuck signal • Tsc – Tsi Tsc : current temperature Tsi : InitialTemperature (Initialization is first satisfied for monitoring condition)	<5 °C	• Fluid temperature sensor • TCM	• Fluid temperature sensor • Harness & connector
• Variation of oil temperature • | Tjc – Tji | Tjc : current temperature Tji : old temp. before 10 sec	>10°C		
• Stuck of High temperature • Oil temperature - Coolant temp	>15°C		
• Accumulated time interval to satisfy Enable condition. • T_Tar : Time interval to reach target temperature after cranking. This map depends on oil temperature at cranking.	>T_tar		



1) Connect scantool to data link connector(DLC)
2) Engine "ON" .
3) Monitor the "TRANSAXLE FLUID TEMPERATURE SENSOR" parameter on the scantool

Does "TRANSAXLE FLUID TEMPERATURE SENSOR " follow the referance data?

Fault is intermittent caused by poor contact in the sensor's and/or TCM(PCM)'s connector or was repaired and TCM(PCM) memory was not cleared. Throughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration or damage.
Repair or replace as necessary and go to "Verification Vehicle Repair" procedure

1) Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2) Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.

Has a problem been found?

After a repair, it is essential to verify that the fault has been corrected.

1) Connect scan tool and select "Diagnostic Trouble Codes(DTCs)" mode.
2) Using a scantool, Clear DTC.
3) Operate the vehicle within DTC Enable conditions in General information.

Are any DTCs present ?

1. CHECK "TRANSAXLE FLUID TEMPERATURE SENSOR"

1) Ignition "OFF" .
2) Disconnect the "TRANSAXLE FLUID TEMPERATURE SENSOR" connector
3) Measure the resistance between terminals "1" and "2" of the "TRANSMISSION FLUID TEMPERATURE SENSOR".

Is resistance within specifications?

Go to the applicable troub eshooting procedure.

System performing to specification at this time.

1) Ignition "ON" & Engine "OFF".
2) Connect "TRANSAXLE FLUID TEMPERATURE SENSOR" connector.
3) Install scantool and slect a SIMU-SCAN.
4) Simulate voltage (0¡æ5V) to "TRANSMISSION FLUID TEMPERATURE SENSOR" signal circuit.

Is FLUID TEMP. SENSOR signal value changed according to simulation voltage?

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage.
Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

Substitute with a known-good PCM/TCM and check for proper operation. If the problem is corrected, replace PCM/TCM as necessary and then go to "Verification of Vehicle Repair" procedure.

Automatic Transaxle System > Troubleshooting > P0712

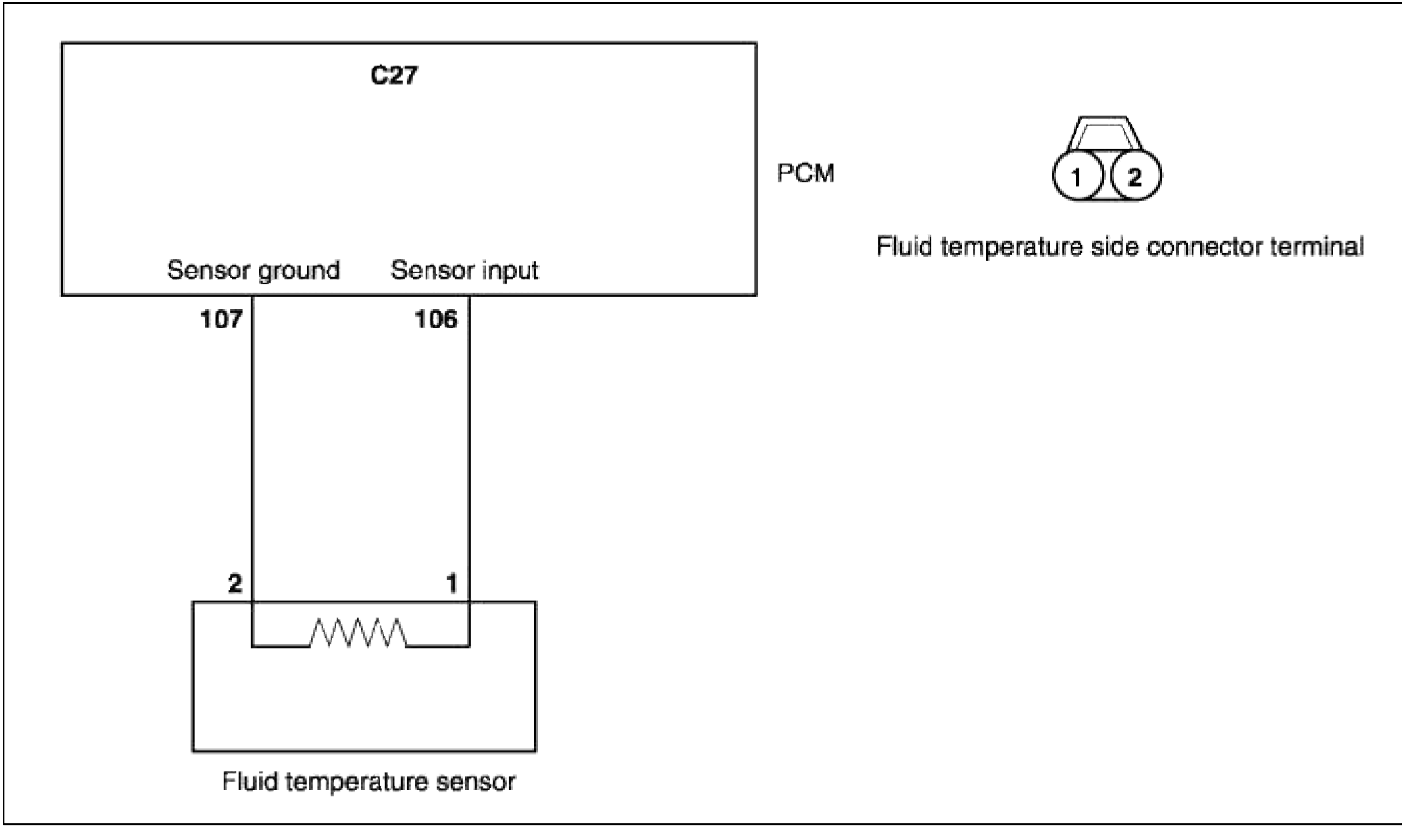
INSPECTION PROCEDURES FOR DIAGNOSTIC TRUBLE CODES

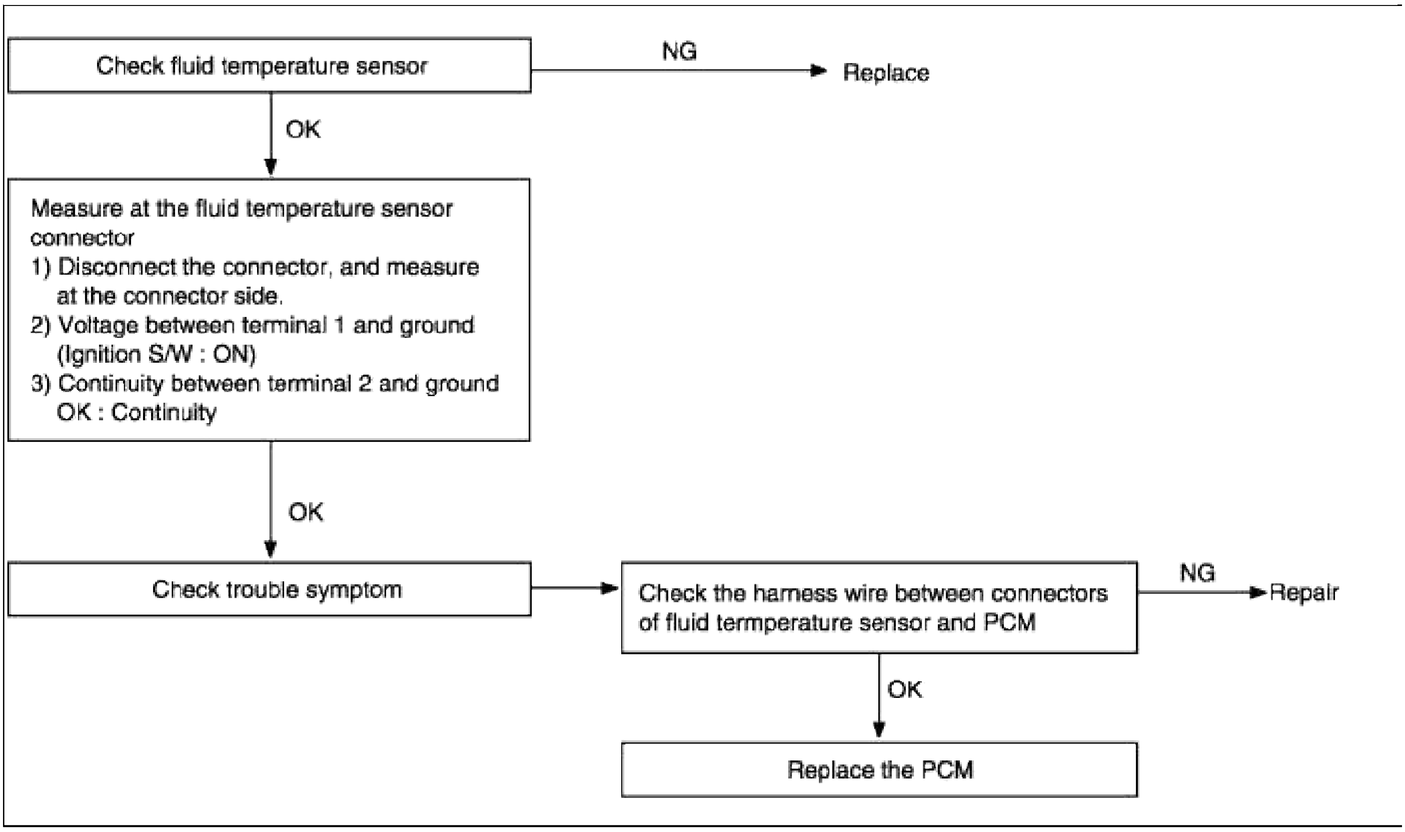
DTC NO	DIAGNOSTIC ITEM	
P0712	FLUID (OIL) TEMPERATURE SENSOR SYSTEM	Short to ground side
P0713	FLUID (OIL) TEMPERATURE SENSOR SYSTEM	Open

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• 10 minutes after engine speed>1000 rpm • 10 minutes after pulse generator B>1000 rpm • Low temperature side output voltage>4.3 V **SYMPTOM** • Shift shock • Power shift pattern will not be available	**Malfunction** • Fluid temperature sensor • PCM	• Fluid temperature sensor • Harness & connector

CIRCUIT DIAGRAM


C27
PCM
Sensor ground
Sensor input
107
106
2
1
Fluid temperature sensor
1
2
Fluid temperature side connector terminal


Check fluid temperature sensor
NG
Replace
OK
Measure at the fluid temperature sensor connector
1) Disconnect the connector, and measure at the connector side.
2) Voltage between terminal 1 and ground (Ignition S/W : ON)
3) Continuity between terminal 2 and ground OK : Continuity
OK
Check trouble symptom
Check the harness wire between connectors of fluid termperature sensor and PCM
NG
Repair
OK
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0713

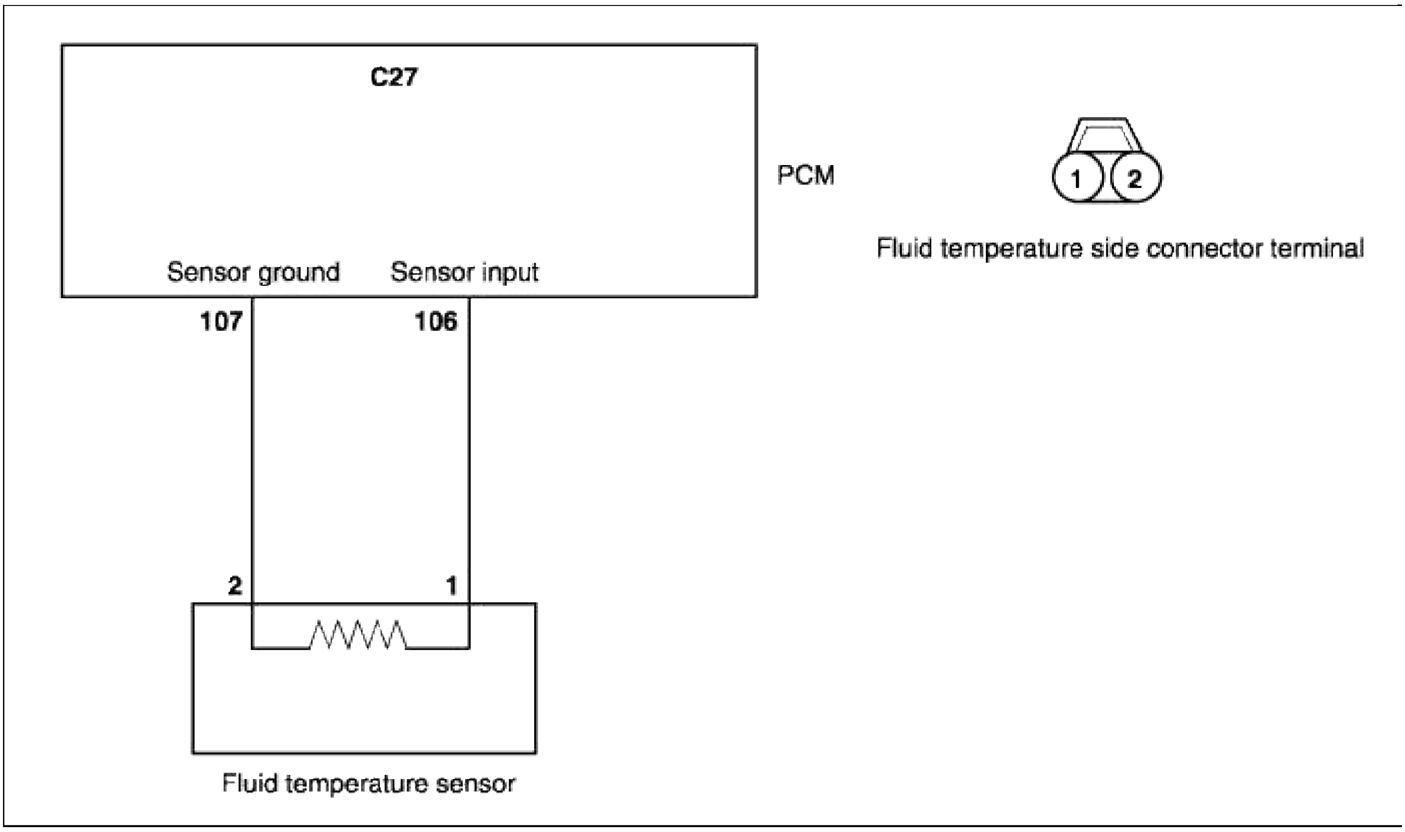
INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

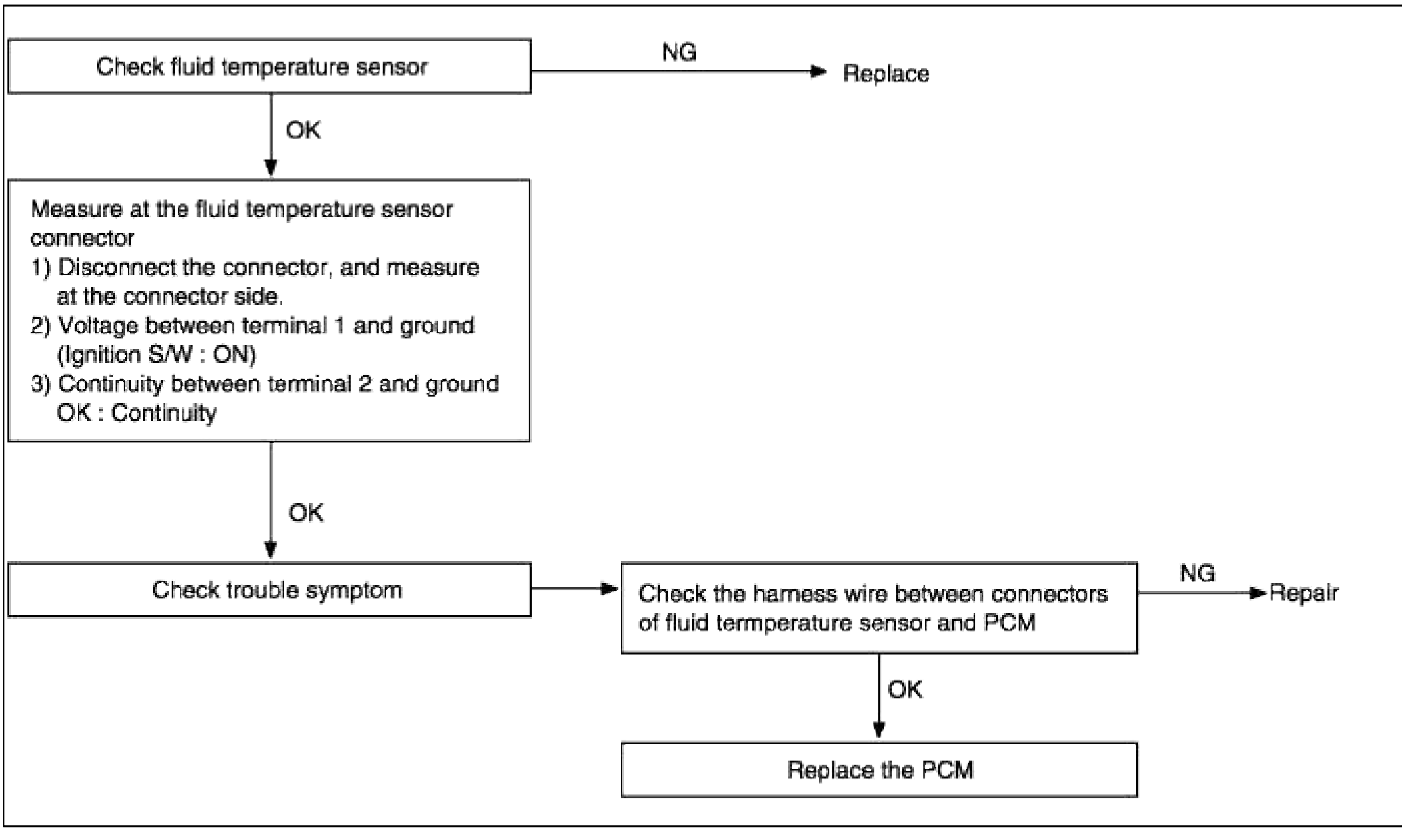
DTC NO	DIAGNOSTIC ITEM	
P0712	FLUID (OIL) TEMPERATURE SENSOR SYSTEM	Short to ground side
P0713	FLUID (OIL) TEMPERATURE SENSOR SYSTEM	Open

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• 10 minutes after engine speed>1000 rpm • 10 minutes after pulse generator B>1000 rpm • Low temperature side output voltage>4.3 V **SYMPTOM** • Shift shock • Power shift pattern will not be available	**Malfunction** • Fluid temperature sensor • PCM	• Fluid temperature sensor • Harness & connector

CIRCUIT DIAGRAM


C27
PCM
Sensor ground
Sensor input
107
106
2
1
Fluid temperature sensor
1
2
Fluid temperature side connector terminal


Check fluid temperature sensor
NG
Replace
OK
Measure at the fluid temperature sensor connector
1) Disconnect the connector, and measure at the connector side.
2) Voltage between terminal 1 and ground (Ignition S/W : ON)
3) Continuity between terminal 2 and ground OK : Continuity
OK
Check trouble symptom
Check the harness wire between connectors of fluid termperature sensor and PCM
NG
Repair
OK
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0717

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0717	PULSE GENERATOR A	- Open, short circuit -

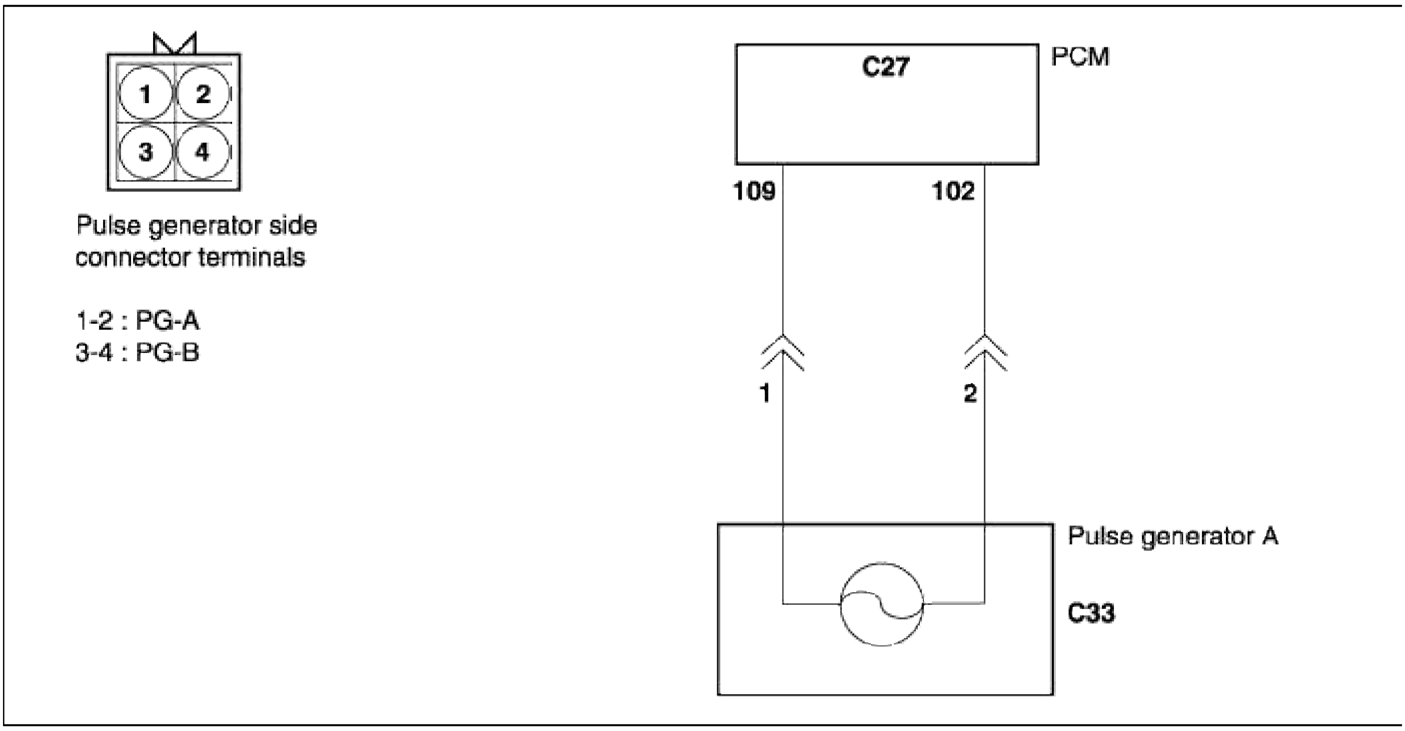
DESCRIPTION

- Detects non-operating area of damper clutch.
- Detects turbine rpm for control of fluid pressure during a shift.

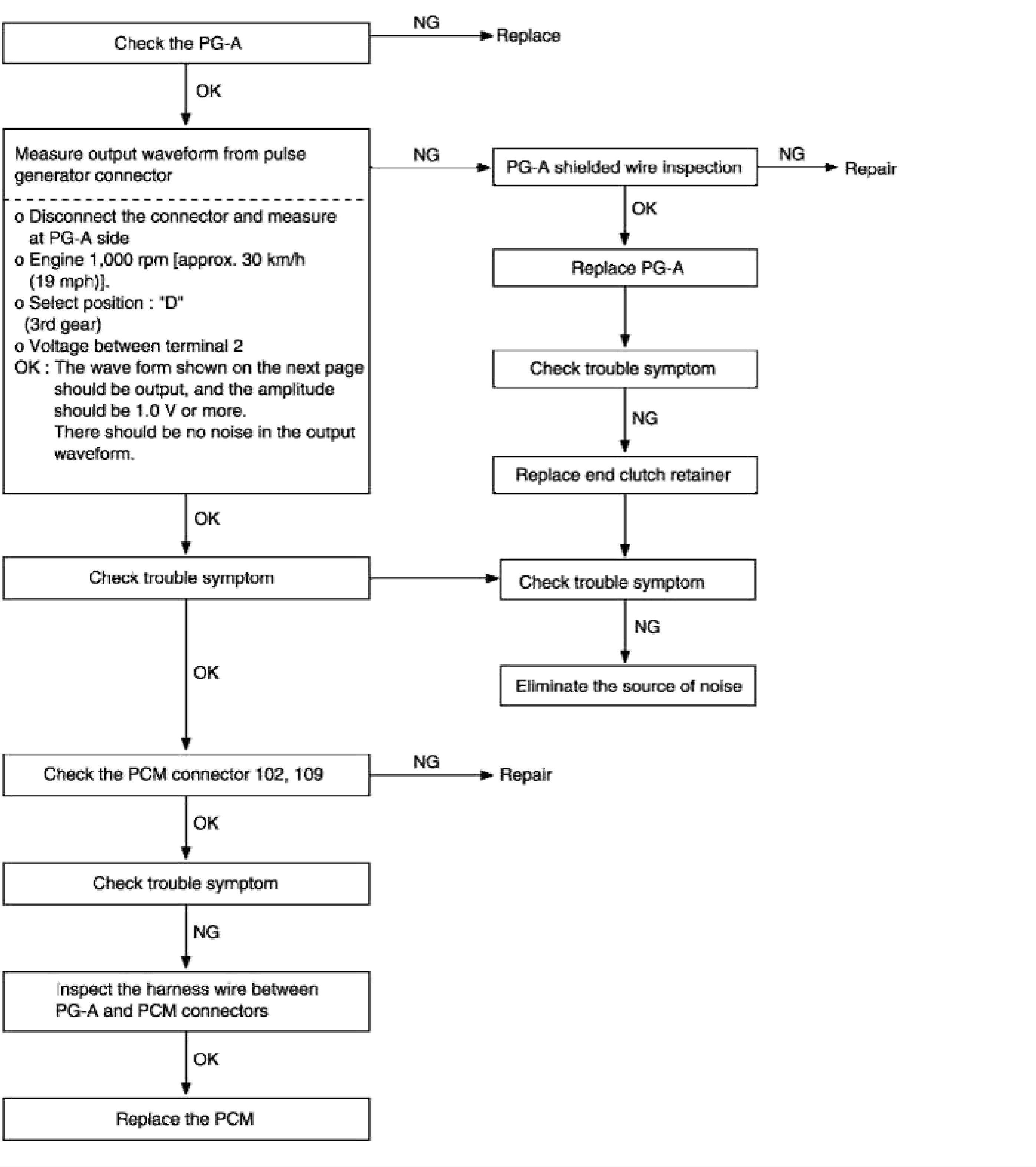
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• Vehicle speed sensor speed>30km/h • Transaxle range : D, 2 or L • Engine speed>3,000rpm • Shift position : 2nd, 3rd or 4th gear	• Malfunction of PG-A • Malfunction of connector • Malfunction of PCM • Malfunction of end clutch retainer	• Harness & connector
SYMPTOM • Shift shock during 2nd and 4th gear shifting. • When code P0717 is generated, automatic transaxle hold in 3rd gear ("D" range) or 2nd gear ("2", "L" range). • Codes P0731, P0732, P0733 and P0734 may also be set.		

TROUBLESHOOTING GUIDE


1
2
3
4
Pulse generator side connector terminals
1-2 : PG-A
3-4 : PG-B
C27
PCM
109
102
1
2
Pulse generator A
C33

TROUBLESHOOTING FLOW


Check the PG-A
NG
Replace
OK
Measure output waveform from pulse generator connector
o Disconnect the connector and measure at PG-A side
o Engine 1,000 rpm [approx. 30 km/h (19 mph)].
o Select position : "D" (3rd gear)
o Voltage between terminal 2
OK : The wave form shown on the next page should be output, and the amplitude should be 1.0 V or more. There should be no noise in the output waveform.
NG
PG-A shielded wire inspection
NG
Repair
OK
Replace PG-A
Check trouble symptom
NG
Replace end clutch retainer
OK
Check trouble symptom
Check trouble symptom
NG
Eliminate the source of noise
OK
Check the PCM connector 102, 109
NG
Repair
OK
Check trouble symptom
NG
Inspect the harness wire between PG-A and PCM connectors
OK
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0722

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0722	PULSE GENERATOR B	- Open, short -

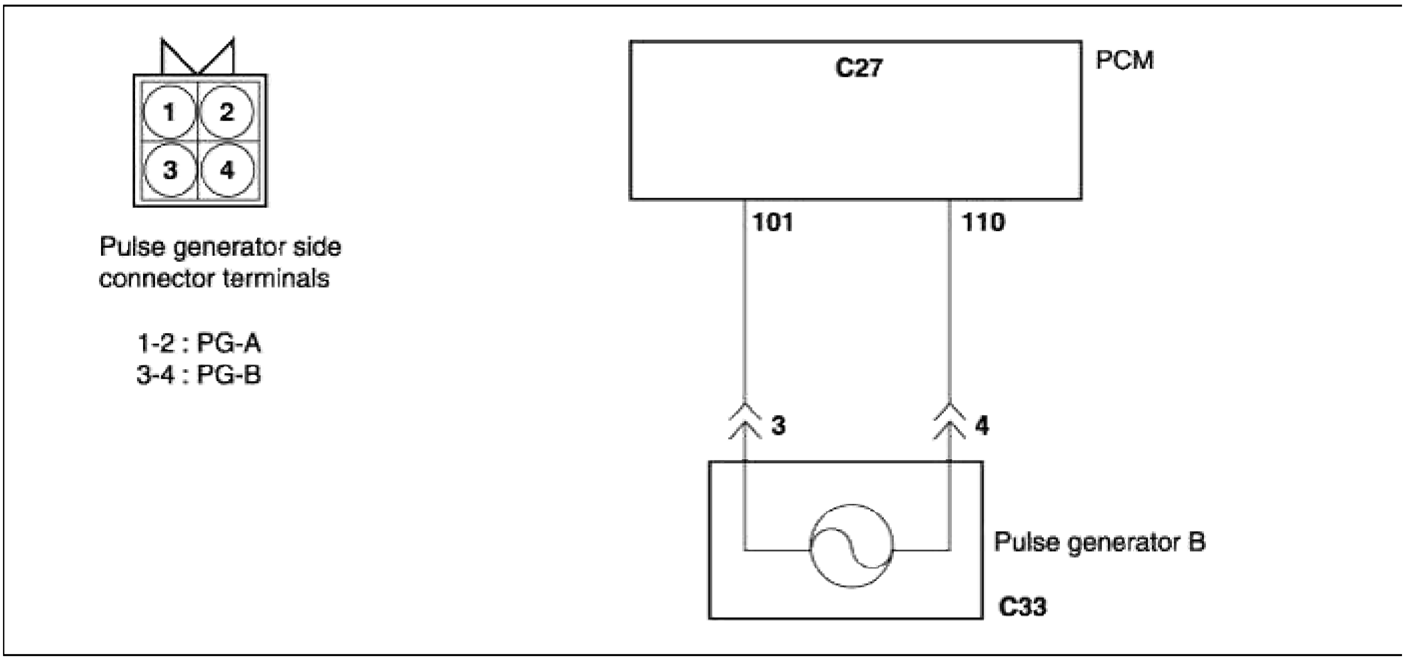
DESCRIPTION

- Detects number of revolutions of the transfer driven gear to monitor vehicle speed.

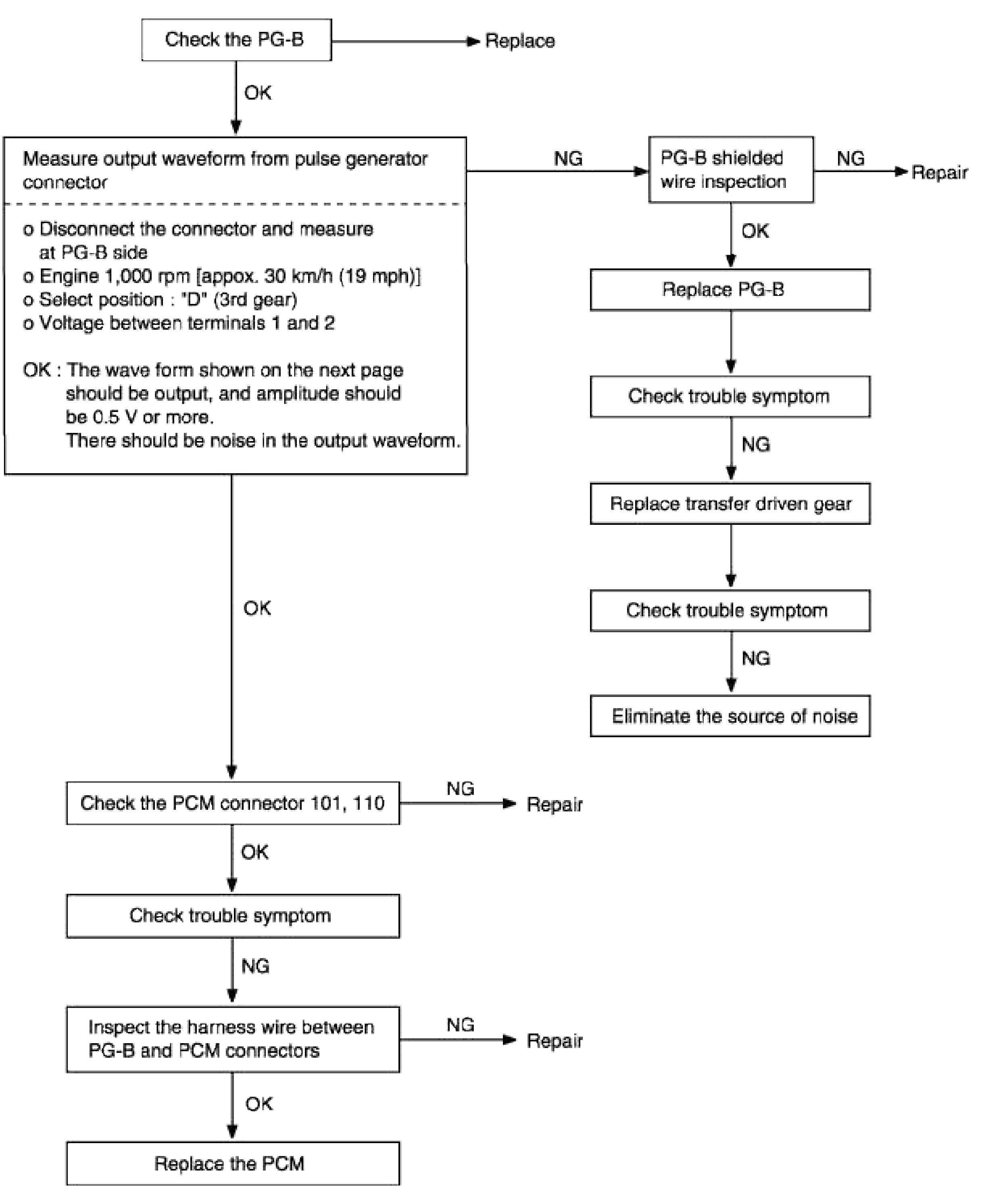
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• Vehicle speed sensor speed>30 km/h • Engine speed>3,000 rpm • Shift position : 2nd, 3rd or 4th gear	• Malfunction of PG-B • Malfunction of connector • Malfunction of PCM • Malfunction of transfer driven gear	• Open in PG-B circuit • Malfunction of PG-B • Noise in signal (Poor or defective shielding) • Chattering of vehicle speed sensor
SYMPTOM • Shift shock during 2nd and 4th gear shifting • When fail-safe code P0722 is generated, automatic transaxle will hold in 3rdgear (D) or 2nd gear (2,L) • Codes P0731, P0732, P0733 and P0734 may also be set		

CIRCUIT DIAGRAM


1
2
3
4
Pulse generator side connector terminals
1-2 : PG-A
3-4 : PG-B
C27
PCM
101
110
3
4
Pulse generator B
C33

TROUBLESHOOTING FLOW


Check the PG-B
Replace
OK
Measure output waveform from pulse generator connector
o Disconnect the connector and measure at PG-B side
o Engine 1,000 rpm [appox. 30 km/h (19 mph)]
o Select position : "D" (3rd gear)
o Voltage between terminals 1 and 2
OK : The wave form shown on the next page should be output, and amplitude should be 0.5 V or more. There should be noise in the output waveform.
NG
PG-B shielded wire inspection
NG
Repair
OK
Replace PG-B
Check trouble symptom
NG
Replace transfer driven gear
Check trouble symptom
NG
Eliminate the source of noise
OK
Check the PCM connector 101, 110
NG
Repair
OK
Check trouble symptom
NG
Inspect the harness wire between PG-B and PCM connectors
NG
Repair
OK
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0731

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0731	FIRST GEAR INCORRECT RATIO	- MALFUNCTION -

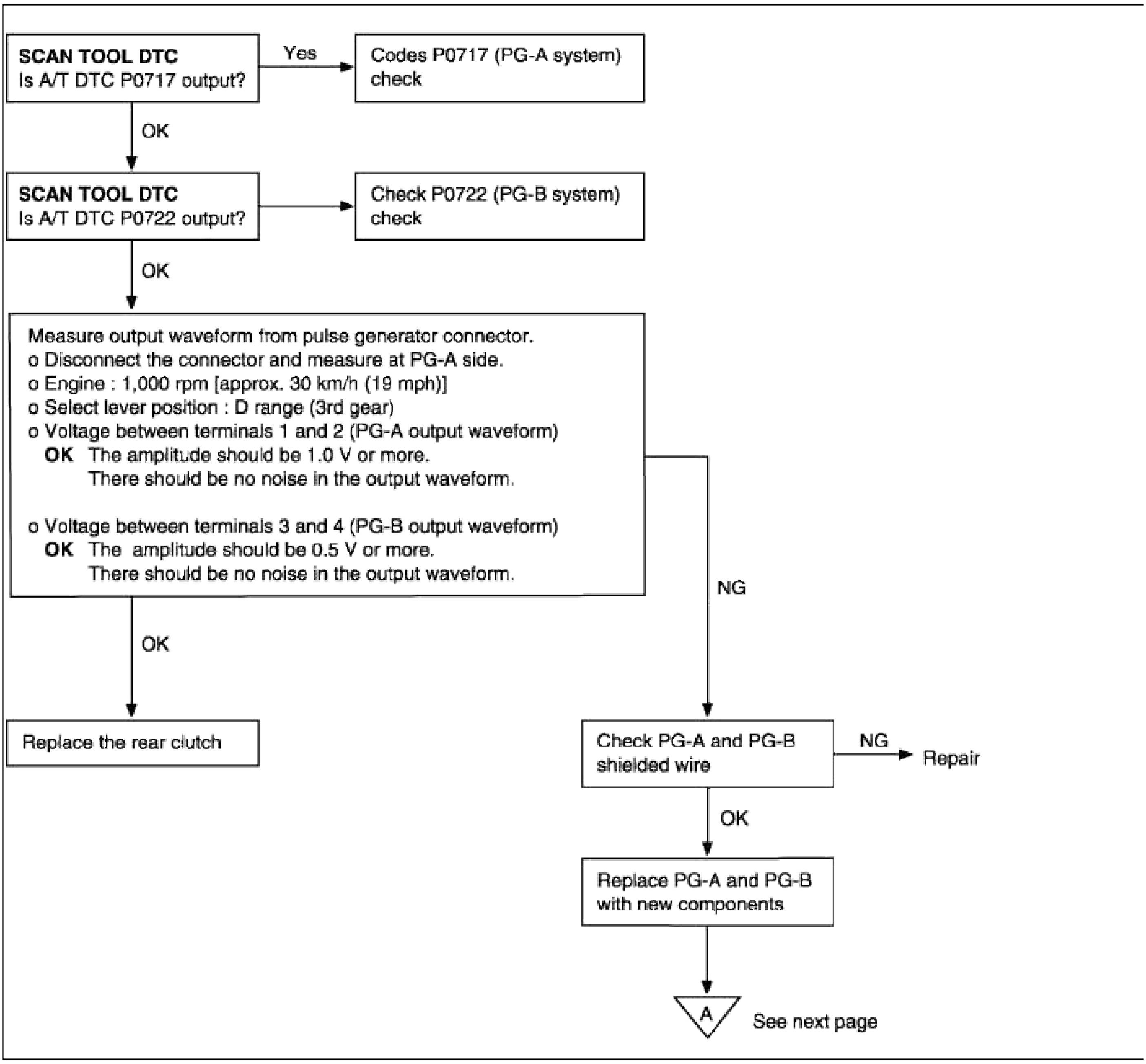
DESCRIPTION

- If the value resulting from driving the PG-A output (input shaft rotation speed) by the 1st gear ratio does not match the PG-B output (output shaft rotation speed) after 1st gear is engaged, DTC P0731 is output.

TROUBLESHOOTING FLOW

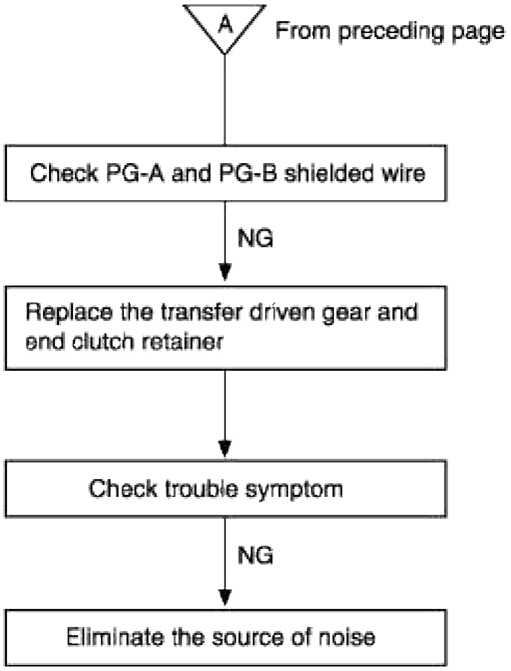
Detection condition	Possible cause	Check item
• Engine speed>400 rpm • Transfer shaft speed>900 rpm • Fluid temperature>60°C • PCM senses a signal that does not fall into the preprogrammed parameters	**Malfunction** • PG-A or PG-B • Transfer driven gear • Rear clutch • One-way clutch	• Malfunction of pulse generator circuit • Rear clutch slippage • One-way clutch slippage
SYMPTOM • Automatic transaxle will hold 3rd gear (D) or 2nd gear (2,L) • Code P0717 or P0722 may also be set (pulse generator codes)		

TROUBLESHOOTING FLOW


SCAN TOOL DTC
Is A/T DTC P0717 output?
Yes
Codes P0717 (PG-A system) check
OK
SCAN TOOL DTC
Is A/T DTC P0722 output?
Check P0722 (PG-B system) check
OK
OK
NG
Replace the rear clutch
Check PG-A and PG-B shielded wire
NG
Repair
OK
Replace PG-A and PG-B with new components
A
See next page

Measure output waveform from pulse generator connector.
o Disconnect the connector and measure at PG-A side.
o Engine : 1,000 rpm [approx. 30 km/h (19 mph)]
o Select lever position : D range (3rd gear)
o Voltage between terminals 1 and 2 (PG-A output waveform)
OK The amplitude should be 1.0 V or more.
There should be no noise in the output waveform.

o Voltage between terminals 3 and 4 (PG-B output waveform)
OK The amplitude should be 0.5 V or more.
There should be no noise in the output waveform.


A
From preceding page
Check PG-A and PG-B shielded wire
NG
Replace the transfer driven gear and end clutch retainer
Check trouble symptom
NG
Eliminate the source of noise

Automatic Transaxle System > Troubleshooting > P0732

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0732	SECOND GEAR SYSTEM	- MALFUNCTION -

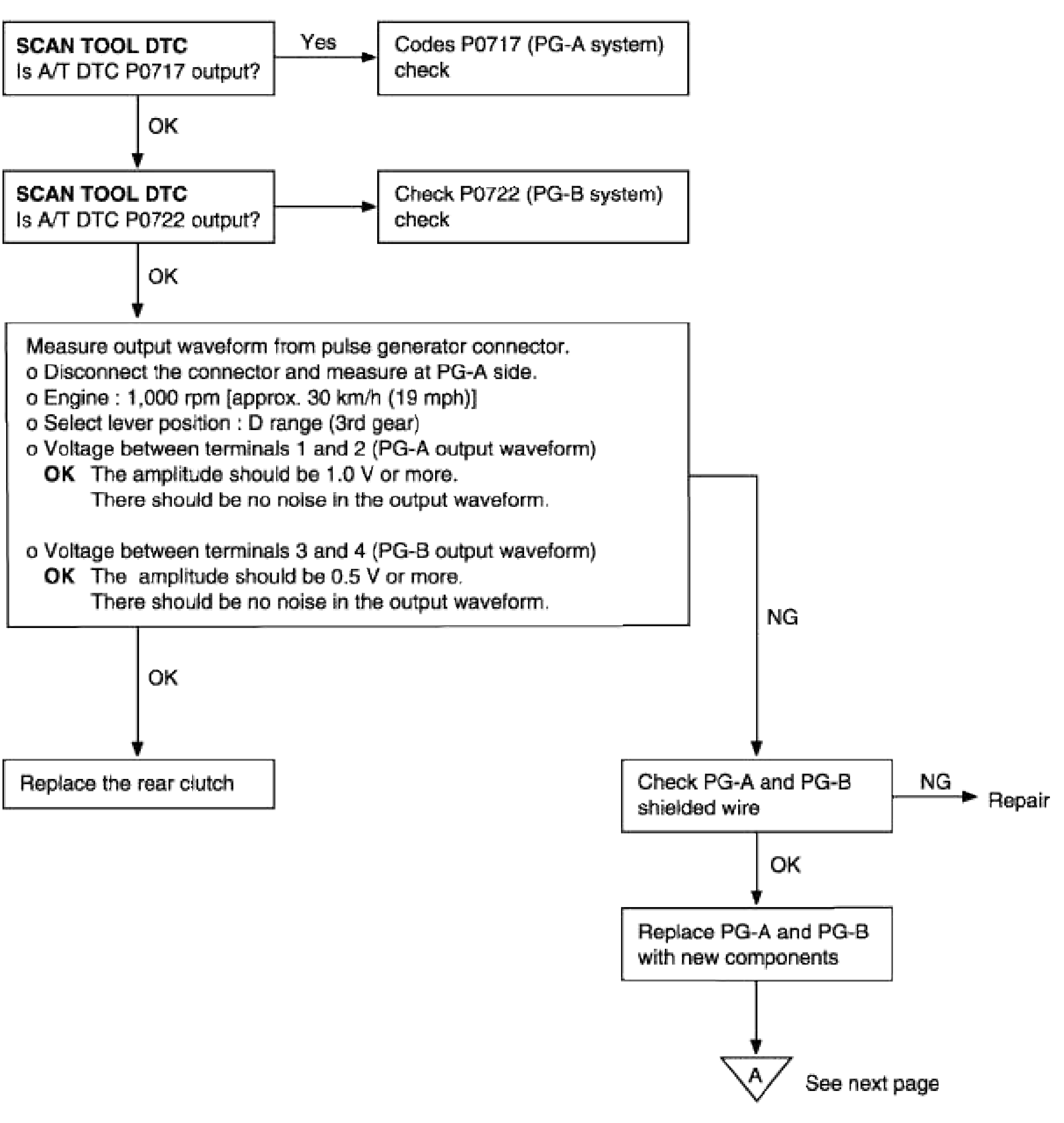
DESCRIPTION

- If the value resulting from driving the PG-A output (input shaft rotation speed) by the 2nd gear ratio does not match the PG-B output (output shaft rotation speed) after 2nd gear is engaged, DTC P0732 is output.

TROUBLESHOOTING GUIDE

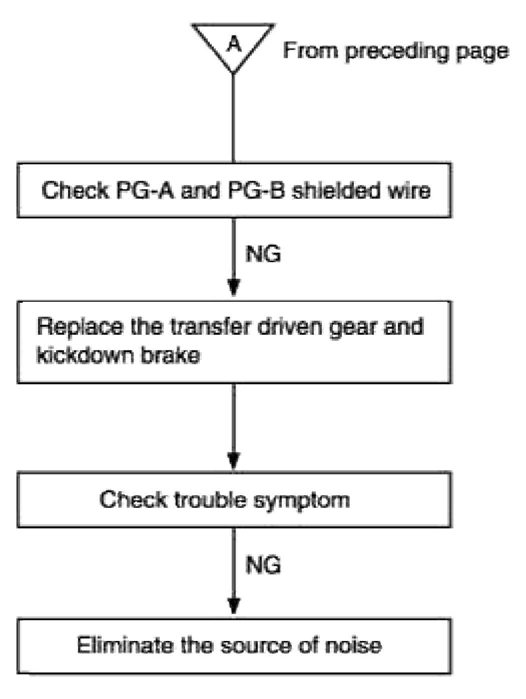
Detection condition	Possible cause	Check item
• If the value resulting from driving the PG-A output (input shaft rotation speed) by the 2nd gear ratio does not match the PG-B output (output shaft rotation speed) after 2nd gear is engaged, DTC P0732 is output	**Malfunction** • PG-A or PG-B • Transfer driven gear • Rear clutch • Kickdown brake	• Malfunction of pulse generator circuit • Rear clutch slippage • Kickdown brake slippage
SYMPTOM • Automatic transaxle will hold in 3rd gear (D) or 2nd gear (2,L)		

TROUBLESHOOTING FLOW


SCAN TOOL DTC
Is A/T DTC P0717 output?
Yes
Codes P0717 (PG-A system) check
OK
SCAN TOOL DTC
Is A/T DTC P0722 output?
Check P0722 (PG-B system) check
OK
OK
Replace the rear clutch
NG
Check PG-A and PG-B shielded wire
NG
Repair
OK
Replace PG-A and PG-B with new components
A
See next page

Measure output waveform from pulse generator connector.
o Disconnect the connector and measure at PG-A side.
o Engine : 1,000 rpm [approx. 30 km/h (19 mph)]
o Select lever position : D range (3rd gear)
o Voltage between terminals 1 and 2 (PG-A output waveform)
OK The amplitude should be 1.0 V or more.
There should be no noise in the output waveform.

o Voltage between terminals 3 and 4 (PG-B output waveform)
OK The amplitude should be 0.5 V or more.
There should be no noise in the output waveform.


A
From preceding page
Check PG-A and PG-B shielded wire
NG
Replace the transfer driven gear and kickdown brake
Check trouble symptom
NG
Eliminate the source of noise

Automatic Transaxle System > Troubleshooting > P0733

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0733	THIRD GEAR SYSTEM	- MALFUNCTION -

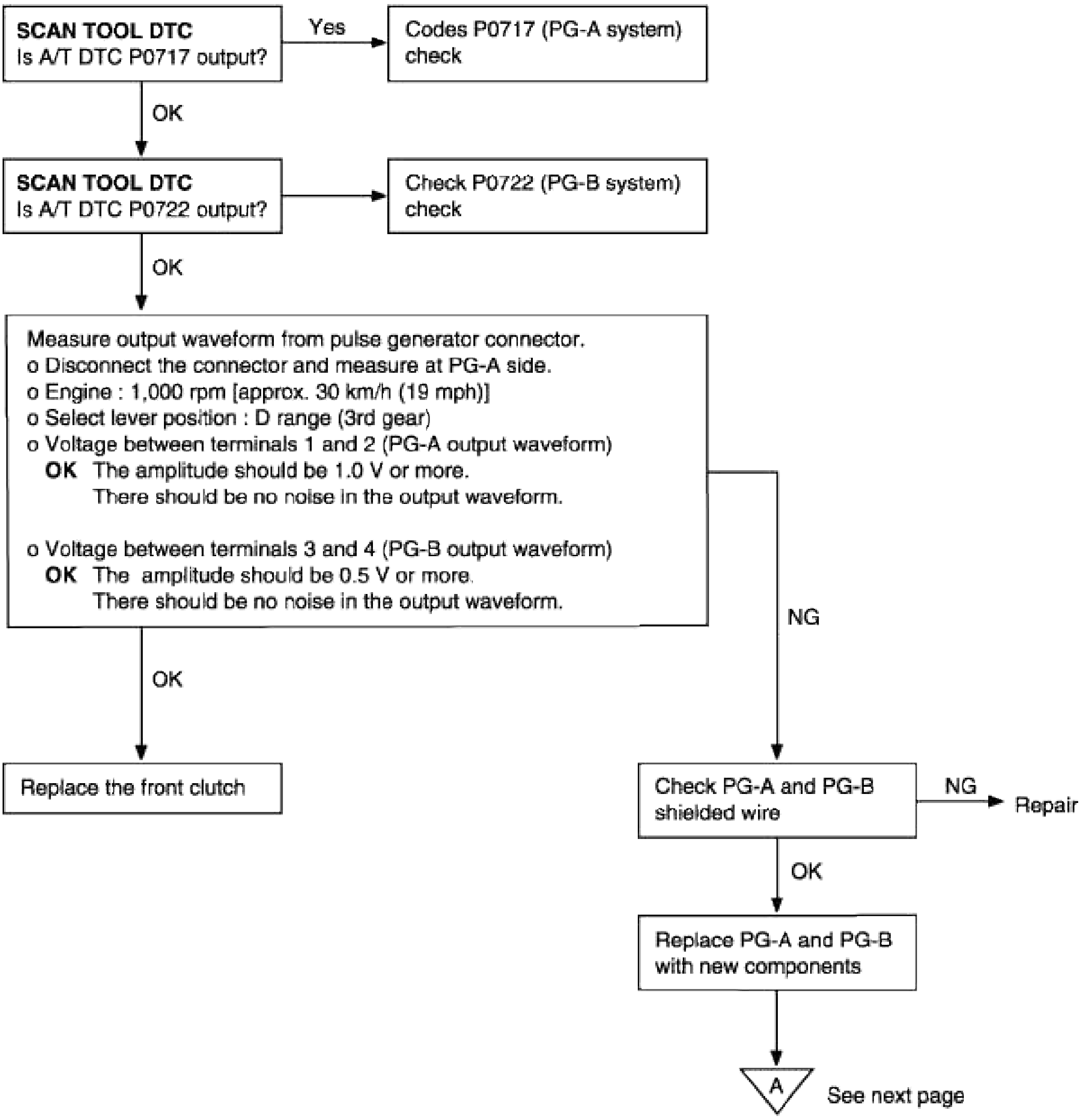
DESCRIPTION

- If the value resulting from driving the PG-A output (input shaft rotation speed) by the 3rd gear ratio does not match the PG-B output (output shaft rotation speed) after 3rd gear is engaged, DTC P0733 is output.

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• Engine speed>400 rpm • Transfer shaft speed>900 rpm • Fluid temperature>60°C • PCM senses a signal that does not fall into the preprogrammed parameters	**Malfunction** • PG-A or PG-B • Transfer driven gear • End clutch retainer • Front clutch	• Malfunction of pulse generator circuit • Rear clutch slippage • Front clutch slippage
SYMPTOM • Automatic transaxle will hold 3rd gear (D) or 2nd gear (2, L) when code P0731, P0732, P0733, P0734 is output • Code P0717 or P0722 may also be set (pulse generator codes)		

TROUBLESHOOTING FLOW


SCAN TOOL DTC
Is A/T DTC P0717 output?
Yes
Codes P0717 (PG-A system) check
OK
SCAN TOOL DTC
Is A/T DTC P0722 output?
Check P0722 (PG-B system) check
OK
OK
Replace the front clutch
NG
Check PG-A and PG-B shielded wire
NG
Repair
OK
Replace PG-A and PG-B with new components
A
See next page

Measure output waveform from pulse generator connector.

o Disconnect the connector and measure at PG-A side.

o Engine : 1,000 rpm [approx. 30 km/h (19 mph)]

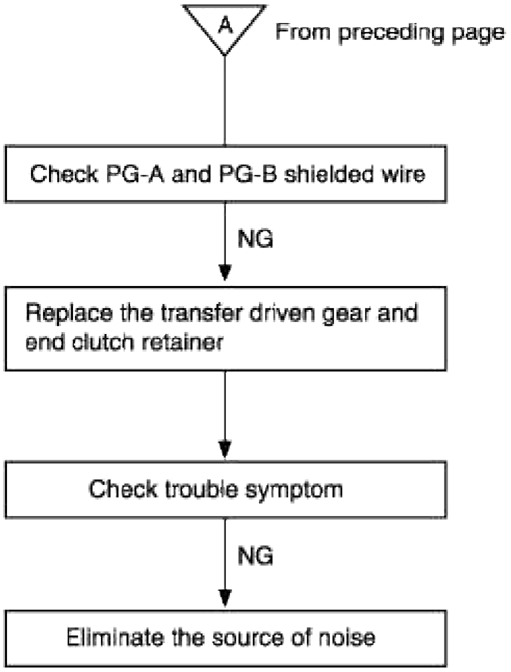
o Select lever position : D range (3rd gear)

o Voltage between terminals 1 and 2 (PG-A output waveform)

OK The amplitude should be 1.0 V or more.
There should be no noise in the output waveform.

o Voltage between terminals 3 and 4 (PG-B output waveform)

OK The amplitude should be 0.5 V or more.
There should be no noise in the output waveform.


A
From preceding page
Check PG-A and PG-B shielded wire
NG
Replace the transfer driven gear and end clutch retainer
Check trouble symptom
NG
Eliminate the source of noise

Automatic Transaxle System > Troubleshooting > P0734

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0734	FOURTH GEAR SYSTEM	- MALFUNCTION -

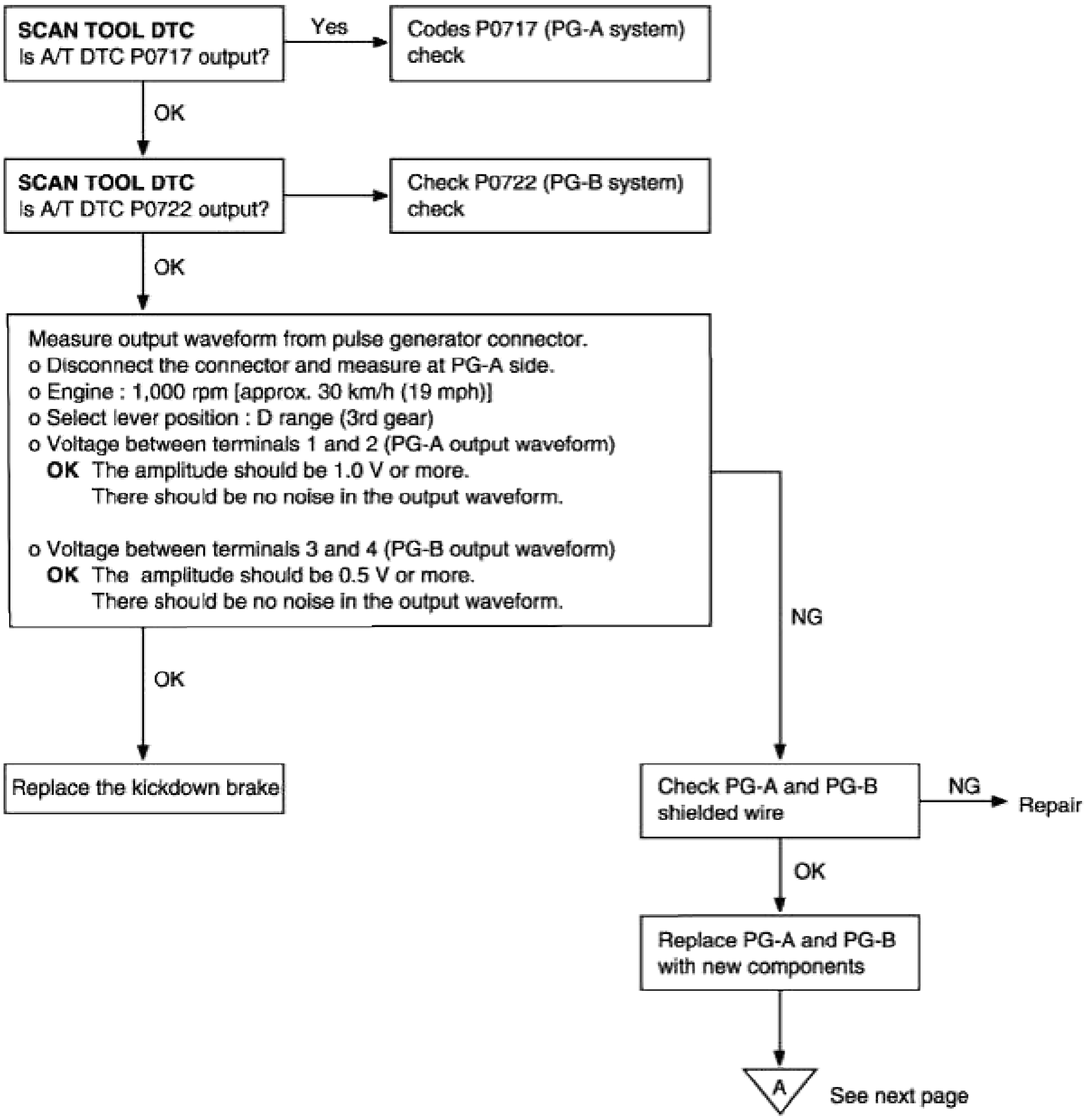
DESCRIPTION

- If the value resulting from driving the PG-A output (input shaft rotation speed) by the 4th gear ratio does not match the PG-B output (output shaft rotation speed) after 4th gear is engaged, DTC P0734 is output.

TROUBLESHOOTING GUIDE

Detection condition	Possible cause	Check item
• Engine speed>400 rpm • Transfer shaft speed >900 rpm • Fluid temperture>60°C • PCM senses a signal that does not fall into the preprogrammed parameters.	**Malfunction** • PG-B • Transfer driven gear • End clutch retainer • Kickdown brake • End clutch	• Malfunction of pulse generator circuit • Kickdown brake slippage
SYMPTOM • Automatic transaxle will hold in 3rd gear (D) or 2nd gear (2, L) when code P0731, P0732, P0733, P0734 is output. • Code P0717 or P0722 may also be set (pulse generator codes).		

TROUBLESHOOTING FLOW



SCAN TOOL DTC
Is A/T DTC P0717 output?

Codes P0717 (PG-A system) check

SCAN TOOL DTC
Is A/T DTC P0722 output?

Check P0722 (PG-B system) check

Measure output waveform from pulse generator connector.
o Disconnect the connector and measure at PG-A side.
o Engine : 1,000 rpm [approx. 30 km/h (19 mph)]
o Select lever position : D range (3rd gear)
o Voltage between terminals 1 and 2 (PG-A output waveform)
OK The amplitude should be 1.0 V or more.
There should be no noise in the output waveform.

o Voltage between terminals 3 and 4 (PG-B output waveform)
OK The amplitude should be 0.5 V or more.
There should be no noise in the output waveform.

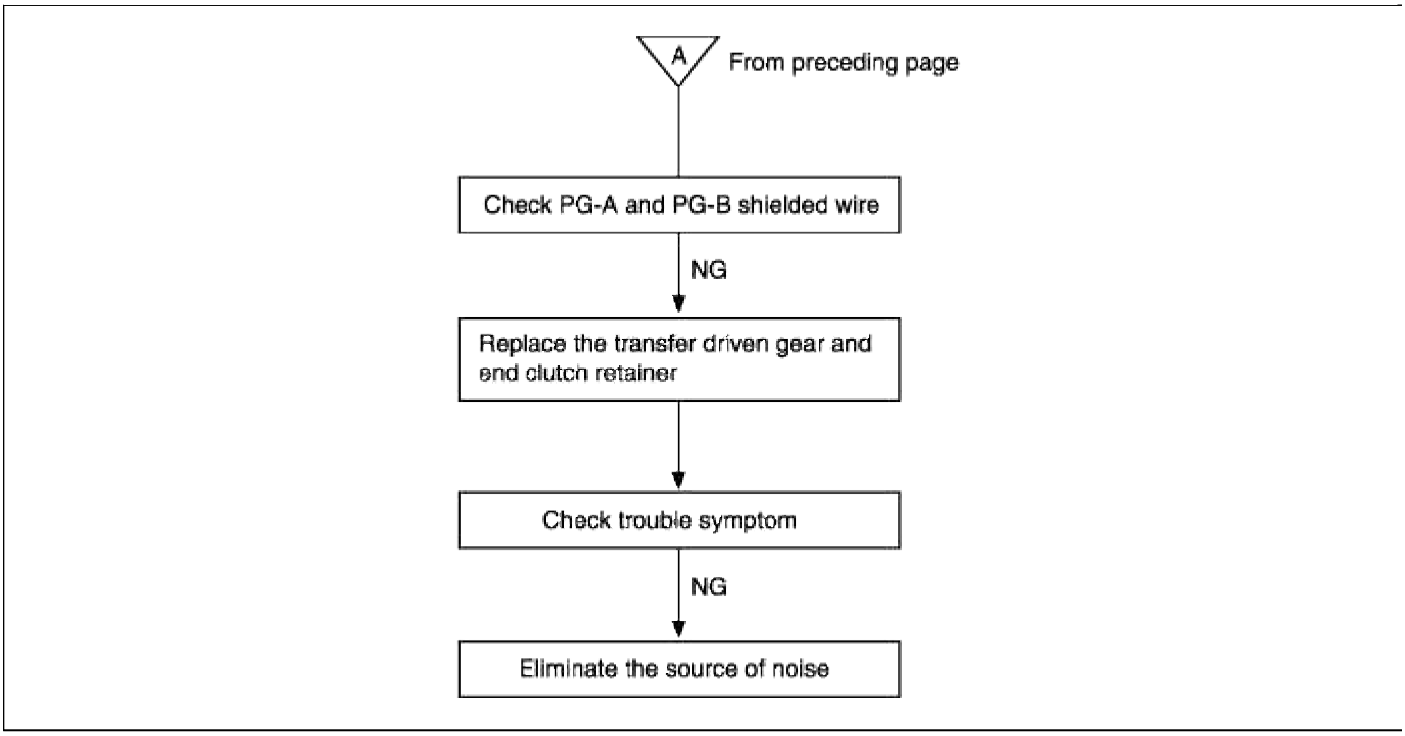
Replace the kickdown brake

Check PG-A and PG-B shielded wire

Repair

Replace PG-A and PG-B with new components

See next page


A
From preceding page
Check PG-A and PG-B shielded wire
NG
Replace the transfer driven gear and end clutch retainer
Check trouble symptom
NG
Eliminate the source of noise

Automatic Transaxle System > Troubleshooting > P0741

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0743	DAMPER CLUTCH CONTROL SOLENOID VALVE	- Open, Short circuit -
P0742	DAMPER CLUTCH SYSTEM	- Stuck ON -
P0741	DAMPER CLUTCH SYSTEM	- Stuck OFF -

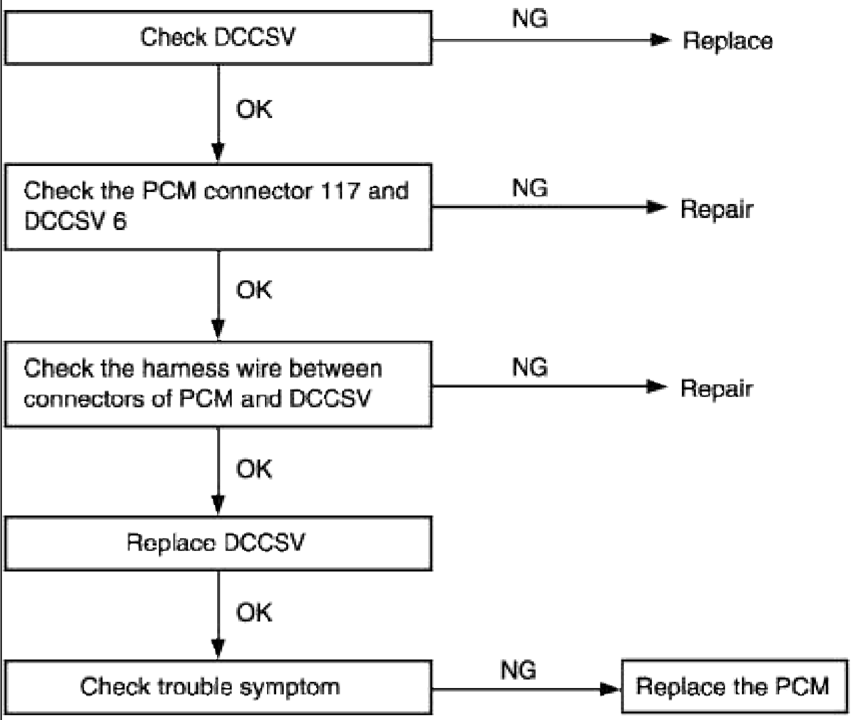
DESCRIPTION

- Controls fluid pressure that is acting on the damper clutch control valve through Pulse Width Modulation signals from the PCM to control the operation of the damper clutch.
- If damper clutch solenoid drive duty continues at 100% for 4 sec. or more, there is an abnormality in the damper clutch control system at DTC P0743 is output.

TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in DCCSV circuit	• Malfunction of connector • Malfunction of PCM	• Open/short in DCCSV circuit • Malfunction of DCCSV
SYMPTOM • Excessive fuel consumption • Poor performance		

TROUBLESHOOTING FLOW


Check DCCSV
NG
Replace
OK
Check the PCM connector 117 and DCCSV 6
NG
Repair
OK
Check the harness wire between connectors of PCM and DCCSV
NG
Repair
OK
Replace DCCSV
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0742

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0743	DAMPER CLUTCH CONTROL SOLENOID VALVE	- Open, Short circuit -
P0742	DAMPER CLUTCH SYSTEM	- Stuck ON -
P0741	DAMPER CLUTCH SYSTEM	- Stuck OFF -

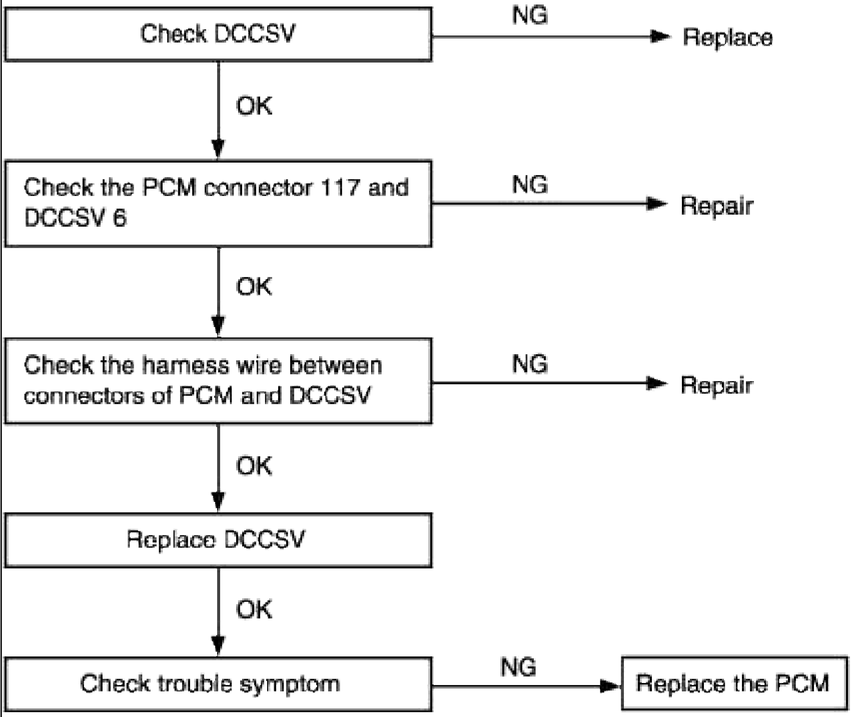
DESCRIPTION

- Controls fluid pressure that is acting on the damper clutch control valve through Pulse Width Modulation signals from the PCM to control the operation of the damper clutch.
- If damper clutch solenoid drive duty continues at 100% for 4 sec. or more, there is an abnormality in the damper clutch control system at DTC P0743 is output.

TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in DCCSV circuit	• Malfunction of connector • Malfunction of PCM	• Open/short in DCCSV circuit • Malfunction of DCCSV
SYMPTOM • Excessive fuel consumption • Poor performance		

TROUBLESHOOTING FLOW


Check DCCSV
NG
Replace
OK
Check the PCM connector 117 and DCCSV 6
NG
Repair
OK
Check the harness wire between connectors of PCM and DCCSV
NG
Repair
OK
Replace DCCSV
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0743

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0743	DAMPER CLUTCH CONTROL SOLENOID VALVE	- Open, Short circuit -
P0742	DAMPER CLUTCH SYSTEM	- Stuck ON -
P0741	DAMPER CLUTCH SYSTEM	- Stuck OFF -

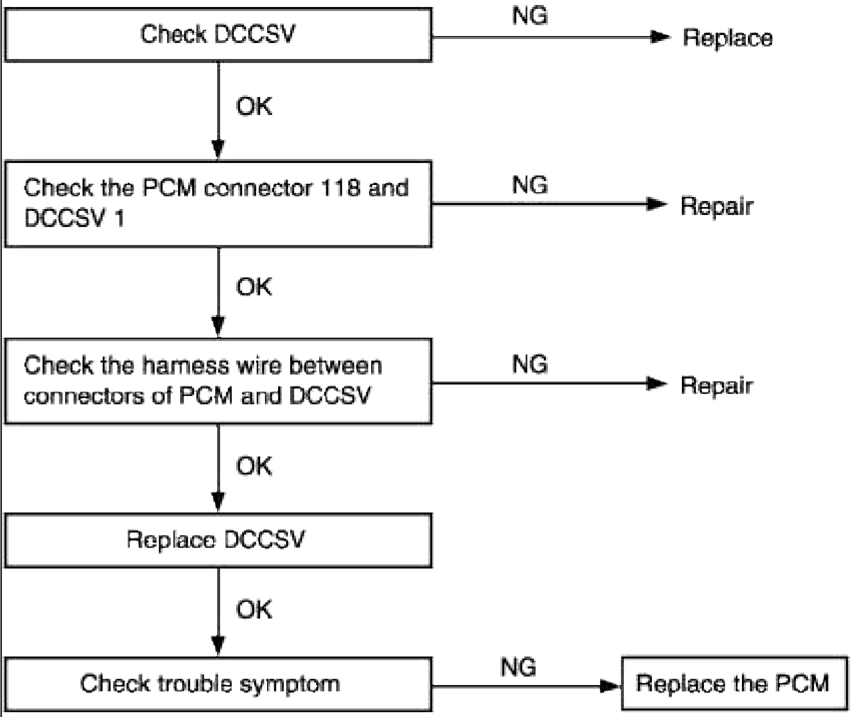
DESCRIPTION

- Controls fluid pressure that is acting on the damper clutch control valve through Pulse Width Modulation signals from the PCM to control the operation of the damper clutch.
- If damper clutch solenoid drive duty continues at 100% for 4 sec. or more, there is an abnormality in the damper clutch control system at DTC P0743 is output.

TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in DCCSV circuit	• Malfunction of connector • Malfunction of PCM	• Open/short in DCCSV circuit • Malfunction of DCCSV
SYMPTOM • Excessive fuel consumption • Poor performance		

TROUBLESHOOTING FLOW


Check DCCSV
NG
Replace
OK
Check the PCM connector 118 and DCCSV 1
NG
Repair
OK
Check the harness wire between connectors of PCM and DCCSV
NG
Repair
OK
Replace DCCSV
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0745

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0745	PRESSURE CONTROL SOLENOID VALVE-A	- Open -, - Short circuit -

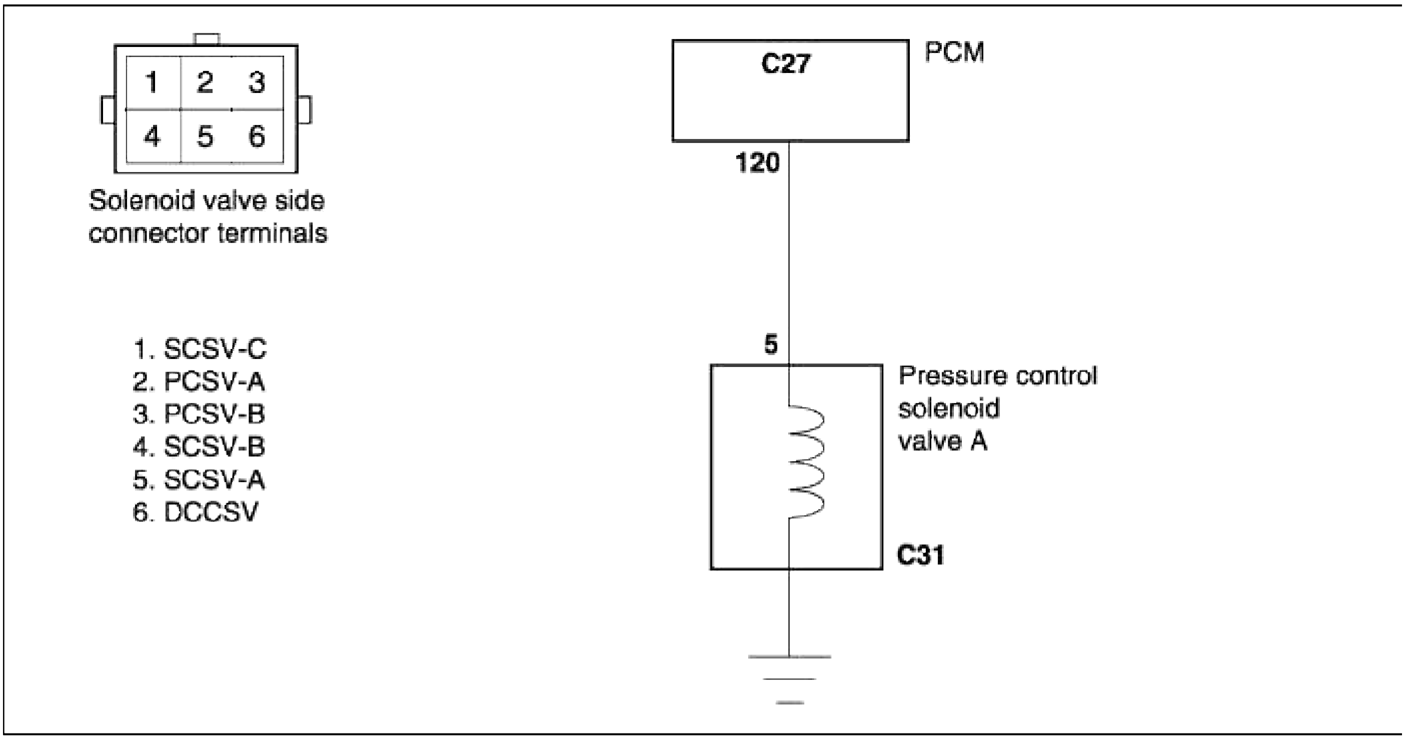
DESCRIPTION

- Controls fluid pressure that is acting on the pressure control valve-A (PCV-A) through Pulse Width Modulation signals from the PCM to control pressure during a shift.

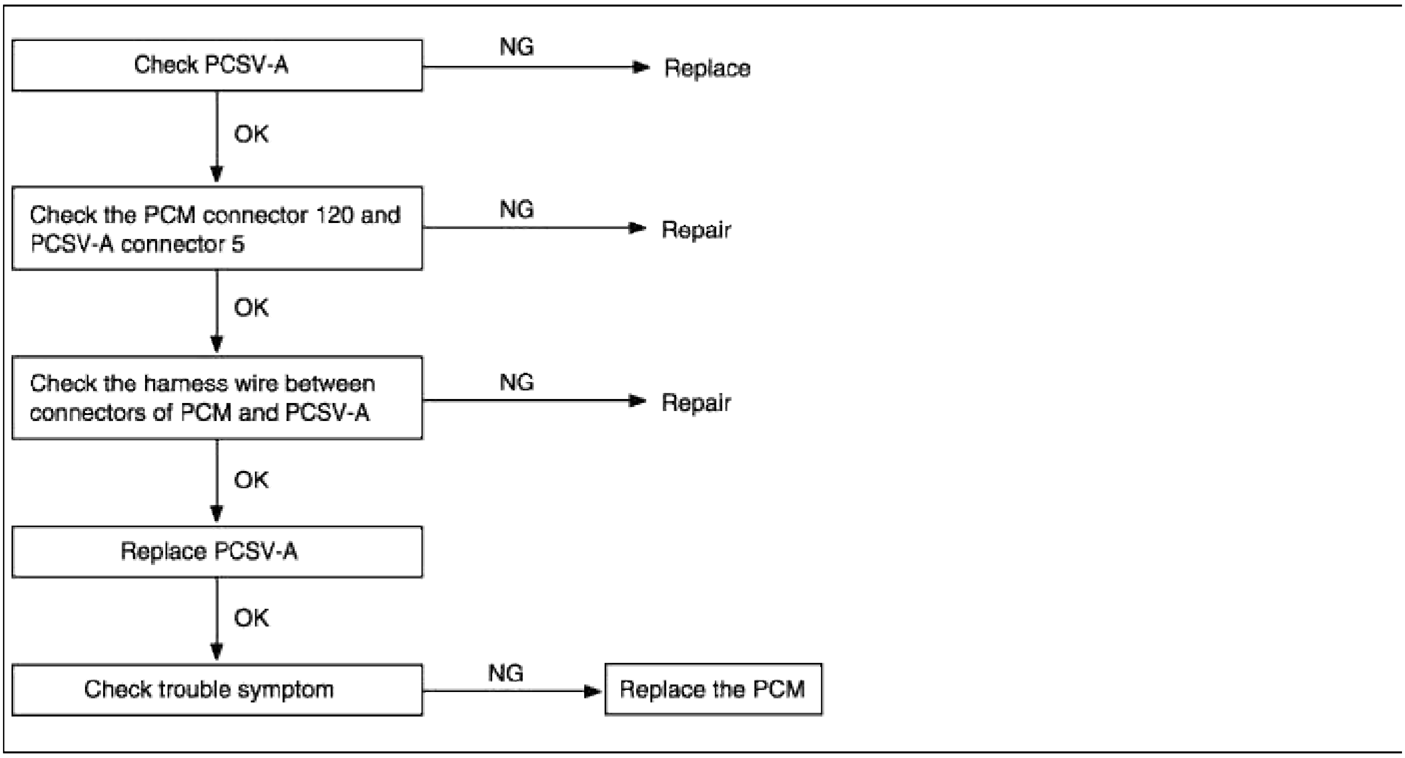
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in the PCSV-A circuit	• Malfunction of PCSV-A • Malfunction of connector • Malfunction of PCM	• Open/short in PCSV-A circuit • Malfunction of PCSV-A
SYMPTOM • Shock felt as transaxle is engaged • Shift shock is felt as transaxle shifts through gears • Abrupt increase of engine rpm • When code P0745 is generated for the 4th time, automatic transaxle will hold 3rd gear (D) or 2nd gear (2,L)		

CIRCUIT DIAGRAM


1
2
3
4
5
6
Solenoid valve side connector terminals
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
C27
PCM
120
5
Pressure control solenoid valve A
C31

TROUBLESHOOTING FLOW


Check PCSV-A
NG
Replace
OK
Check the PCM connector 120 and PCSV-A connector 5
NG
Repair
OK
Check the harness wire between connectors of PCM and PCSV-A
NG
Repair
OK
Replace PCSV-A
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0750

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0750	SHIFT CONTROL SOLENOID VALVE A	- Open -, - Short circuit -

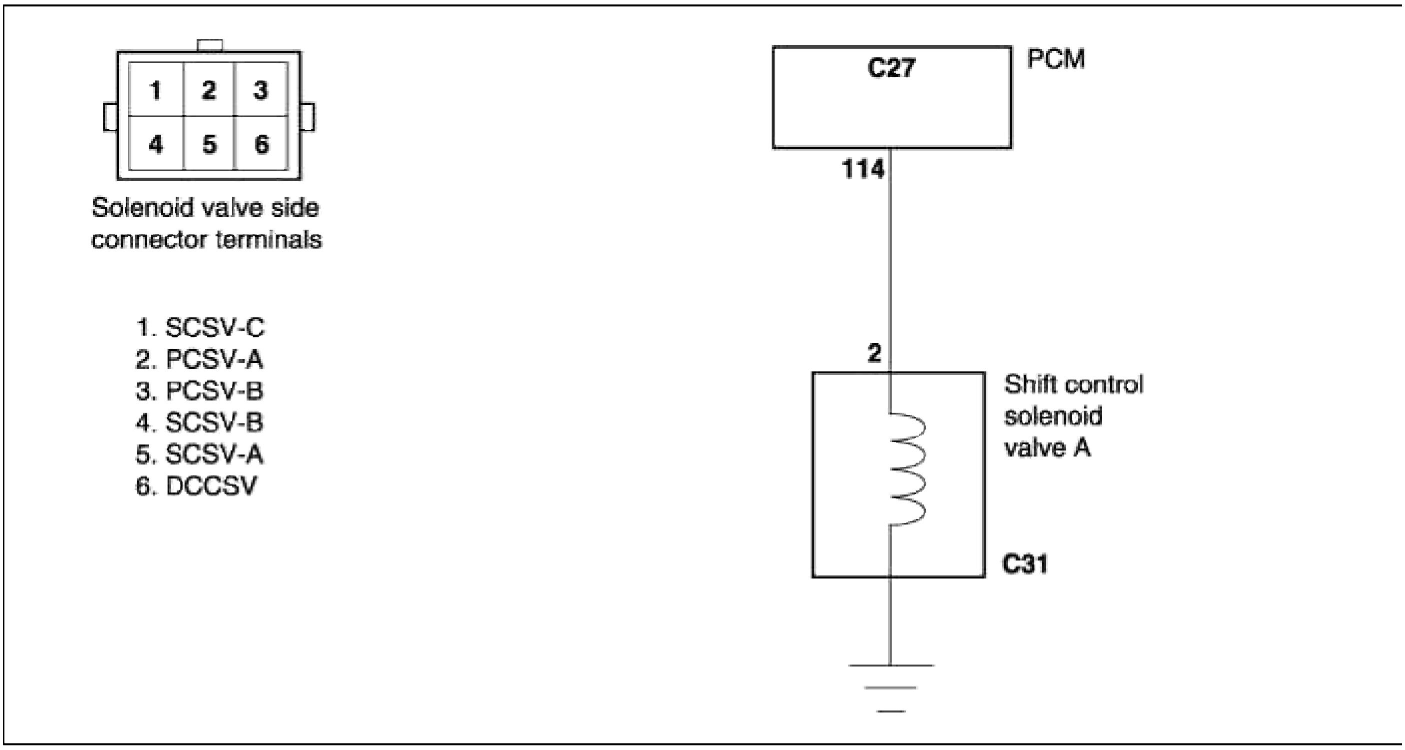
DESCRIPTION

- Control fluid pressure that is acting on the shift control valve (SCV) through ON/OFF signals from the PCM to control shifting.

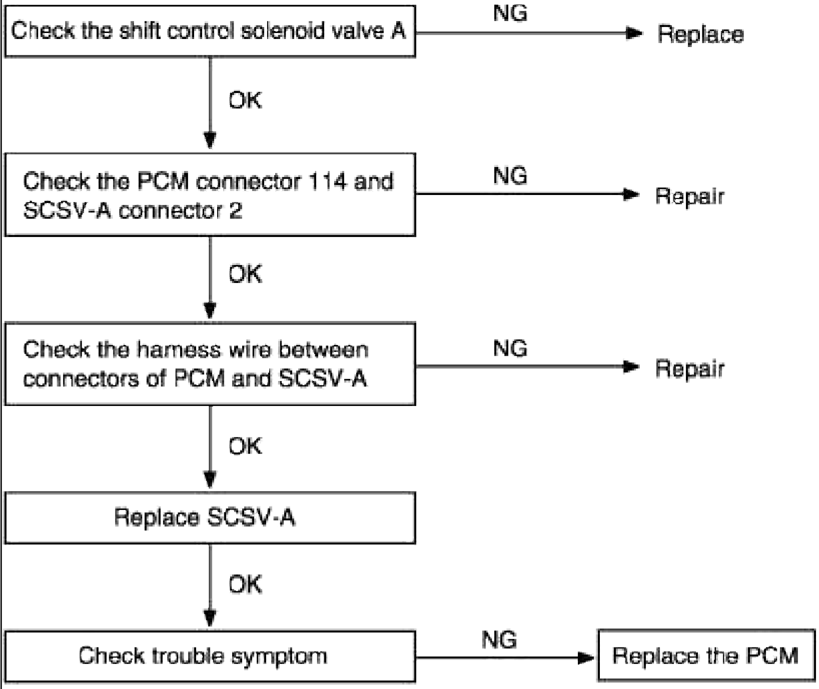
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open/short in the SCSV-A	• Malfunction of PG-A • Malfunction of connector • Malfunction of PCM	• Open/short in SCSV-A circuit • Malfunction of SCSV-A
SYMPTOM • Automatic transaxle will hold 3rd gear when code P0750 is generated.		

CIRCUIT DIAGRAM


1
2
3
4
5
6
Solenoid valve side connector terminals
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
C27
PCM
114
2
Shift control solenoid valve A
C31

TROUBLESHOOTING FLOW


Check the shift control solenoid valve A
NG
Replace
OK
Check the PCM connector 114 and SCSV-A connector 2
NG
Repair
OK
Check the harness wire between connectors of PCM and SCSV-A
NG
Repair
OK
Replace SCSV-A
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0755

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0755	SHIFT CONTROL SOLENOID VALVE B	- Open -, - Short circuit -

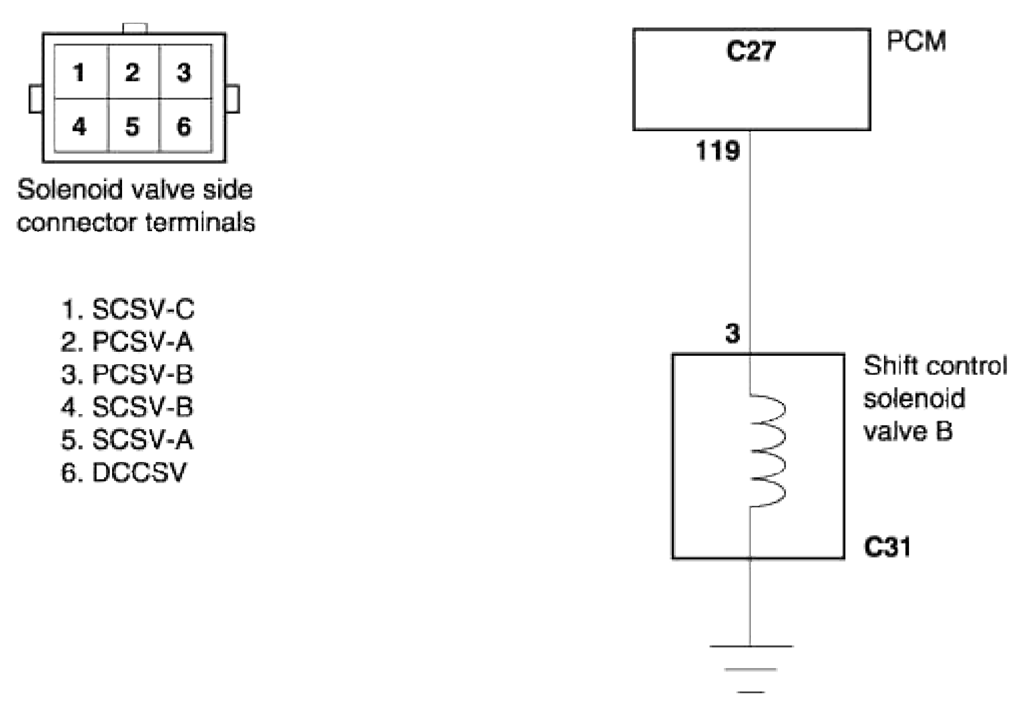
DESCRIPTION

- Controls fluid pressure that is acting on the shift control valve (SCV) through ON/OFF signals from the PCM to control shifting.
- If resistance value of SCSV-B is too high or low, P0755 is output (open or short circuit).

TROUBLESHOOTING FLOW

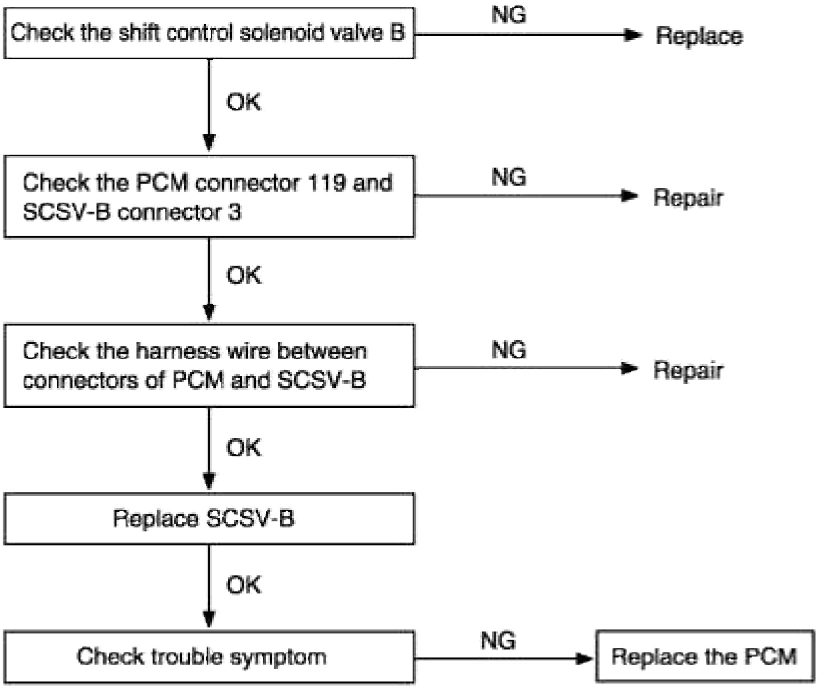
Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open/short in the SCSV-B	• Malfunction of SCSV-B • Malfunction of connector • Malfunction of PCM	• Open/short in SCSV-B circuit • Malfunction of SCSV-B
SYMPTOM • Automatic transaxle will hold 3rd gear when code P0755 is generated.		

CIRCUIT DIAGRAM


1
2
3
4
5
6
Solenoid valve side connector terminals
C27
PCM
119
3
Shift control solenoid valve B
C31

1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV

TROUBLESHOOTING FLOW


Check the shift control solenoid valve B
NG
Replace
OK
Check the PCM connector 119 and SCSV-B connector 3
NG
Repair
OK
Check the harness wire between connectors of PCM and SCSV-B
NG
Repair
OK
Replace SCSV-B
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0760

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0760	SHIFT CONTROL SOLENOID VALVE C	- Open -, - Short circuit -

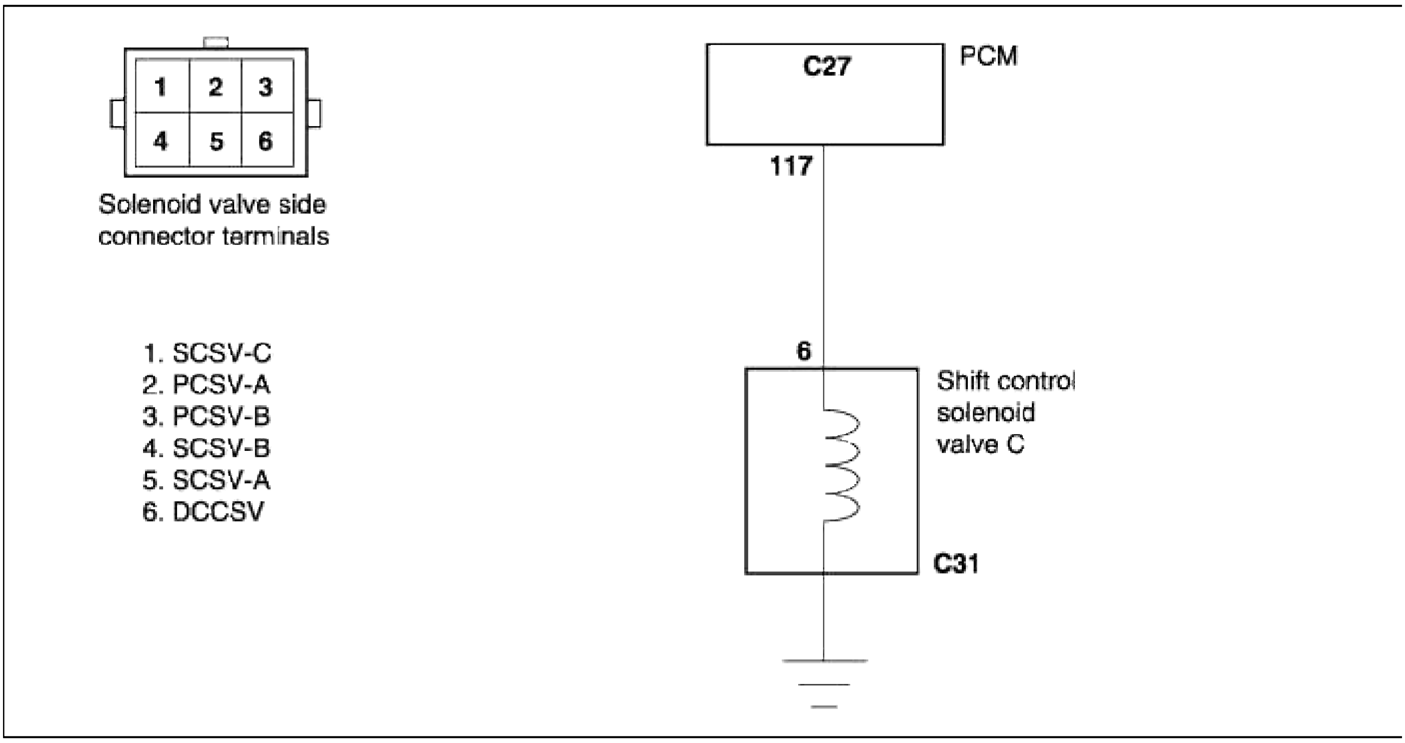
DESCRIPTION

- Controls fluid pressure that is acting on the control switch valve (CSV) through ON/OFF signals from the PCM to control shifting
- If resistance value of SCSV-C is high, P0760 is output (open circuit).

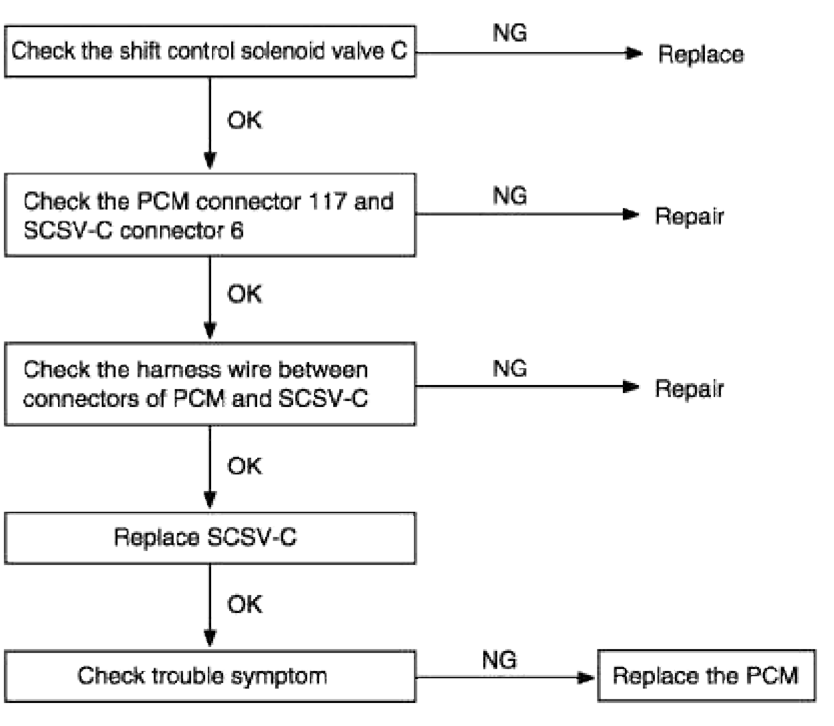
TROUBLESHOOTING FLOW

Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open/short in the SCSV-C	• Malfunction of SCSV-C • Malfunction of connector • Malfunction of PCM	• Open/short in SCSV-C circuit • Malfunction of SCSV-C
SYMPTOM • Automatic transaxle will hold 3rd gear when code P0760 is generated.		

CIRCUIT DIAGRAM


1
2
3
4
5
6
Solenoid valve side connector terminals
1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV
C27
PCM
117
6
Shift control solenoid valve C
C31

TROUBLESHOOTING FLOW


Check the shift control solenoid valve C
NG
Replace
OK
Check the PCM connector 117 and SCSV-C connector 6
NG
Repair
OK
Check the harness wire between connectors of PCM and SCSV-C
NG
Repair
OK
Replace SCSV-C
OK
Check trouble symptom
NG
Replace the PCM

Automatic Transaxle System > Troubleshooting > P0775

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

DTC NO	DIAGNOSTIC ITEM	
P0775	PRESSURE CONTROL SOLENOID VALVE-B	- Open -, - Short circuit -

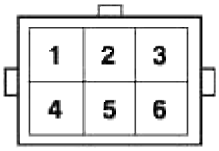
DESCRIPTION

- Controls fluid pressure that is acting on the pressure control valve-B (PCV-B) through Pulse Width Modulation signals from the PCM to control pressure during a shift.

TROUBLESHOOTING FLOW

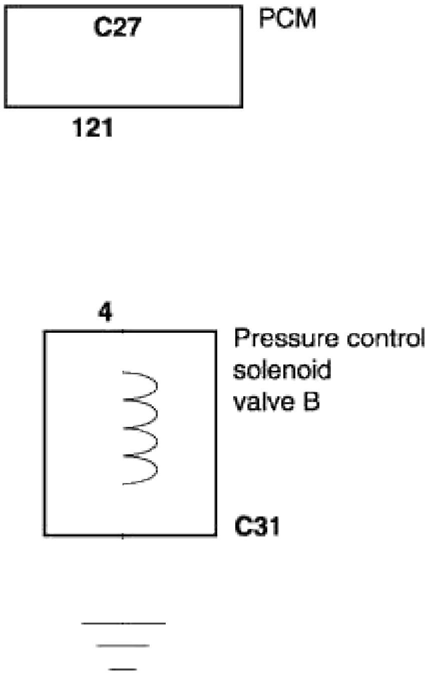
Detection condition	Possible cause	Check item
• IG S/W "ON" or start release • PCM senses an open • Short in the PCSV-B circuit	• Malfunction of PCSV-B • Malfunction of connector • Malfunction of PCM	• Open/short in PCSV-B circuit • Malfunction of PCSV-B
SYMPTOM • Shock felt as transaxle is engaged • Shift shock is felt as transaxle shifts through gears • Abrupt increase of engine rpm • When code P0775 is generated for the 4th time, automatic transaxle will hold 3rd gear (D) or 2nd gear (2,L)		

CIRCUIT DIAGRAM

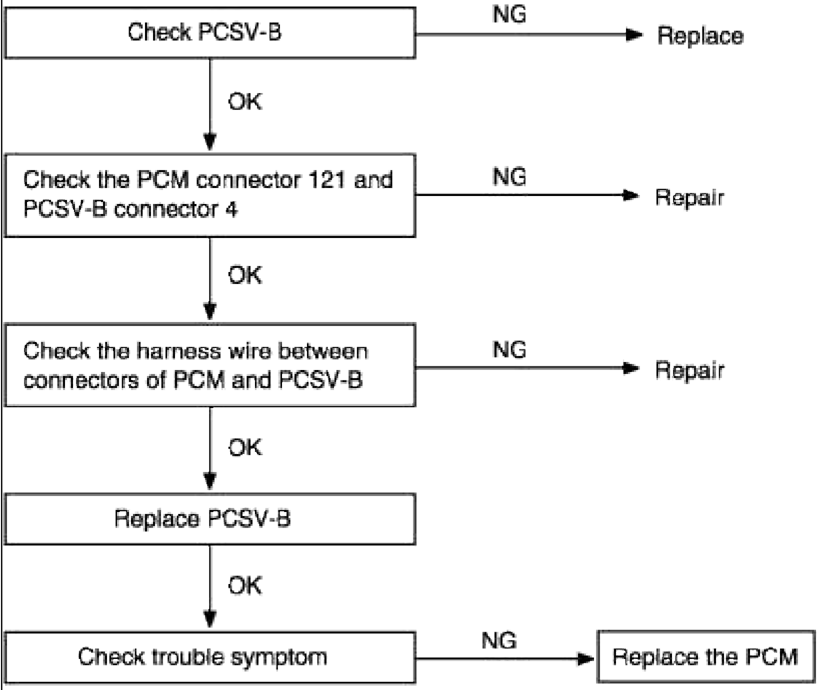


Solenoid valve side connector terminals

1. SCSV-C
2. PCSV-A
3. PCSV-B
4. SCSV-B
5. SCSV-A
6. DCCSV


C27
PCM
121
4
Pressure control solenoid valve B
C31

TROUBLESHOOTING FLOW


Check PCSV-B
NG
Replace
OK
Check the PCM connector 121 and PCSV-B connector 4
NG
Repair
OK
Check the harness wire between connectors of PCM and PCSV-B
NG
Repair
OK
Replace PCSV-B
OK
Check trouble symptom
NG
Replace the PCM

ACCENT(LC) > 2005 > G 1.5 SOHC > Body Electrical System

Body Electrical System > General Information > General Information

GENERAL TROUBLESHOOTING INFORMATION

BEFORE TROUBLESHOOTING

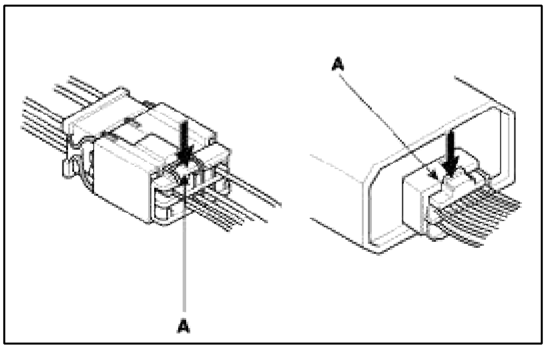
1. Check applicable fuses in the appropriate fuse/relay box.
2. Check the battery for damage, state of charge, and clean and tight connections.

> **NOTE**
>
> - Do not quick-charge a battery unless the battery ground cable has been disconnected, otherwise you will damage the alternator diodes.
> - Do not attempt to crank the engine with the battery ground cable loosely connected or you will severely damage the wiring.

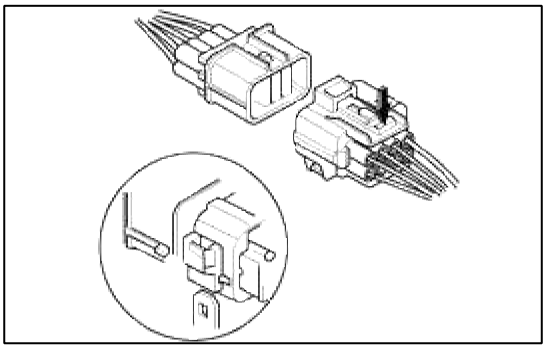
3. Check the alternator belt tension.

HANDLING CONNECTORS

1. Make sure the connectors are clean and have no loose wire terminals.
2. Make sure multiple cavity connectors are packed with grease (except watertight connectors).
3. All connectors have push-down release type locks (A).

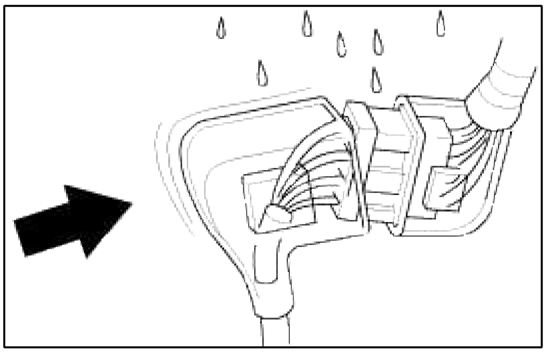


4. Some connectors have a clip on their side used to attach them to a mount bracket on the body or on another component. This clip has a pull type lock.
5. Some mounted connectors cannot be disconnected unless you first release the lock and remove the connector from its mount bracket (A).

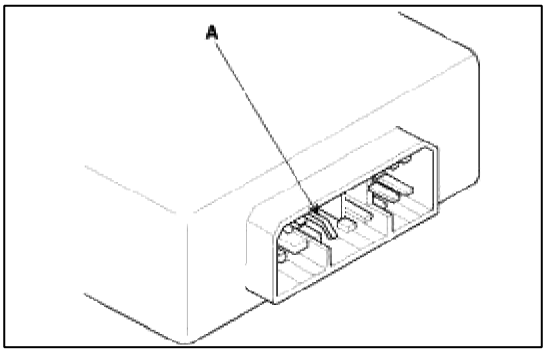


6. Never try to disconnect connectors by pulling on their wires; pull on the connector halves instead.

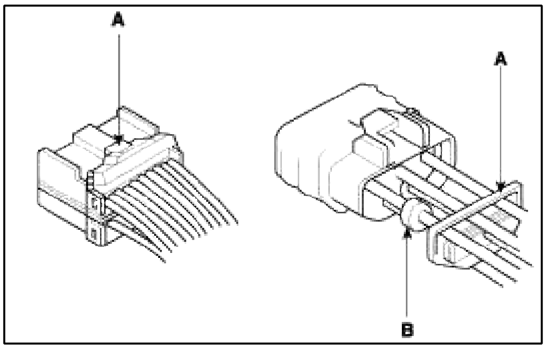
7. Always reinstall plastic covers.



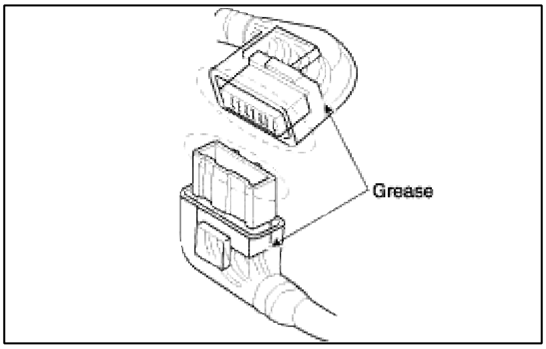
8. Before connecting connectors, make sure the terminals (A) are in place and not bent.



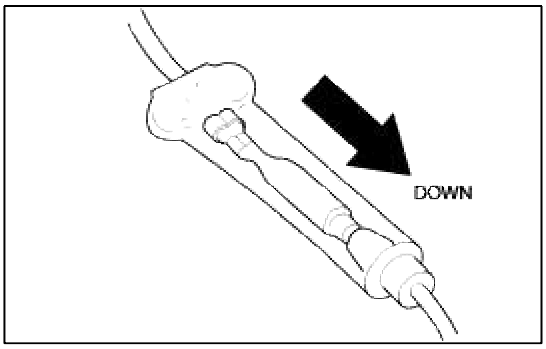
9. Check for loose retainer (A) and rubber seals (B).



10. The backs of some connectors are packed with grease. Add grease if necessary. If the grease is contaminated, replace it.

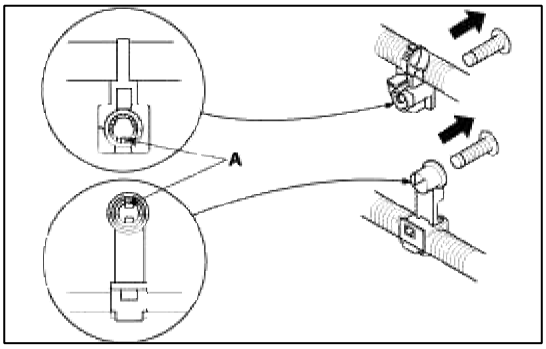


11. Insert the connector all the way and make sure it is securely locked.
12. Position wires so that the open end of the cover faces down.

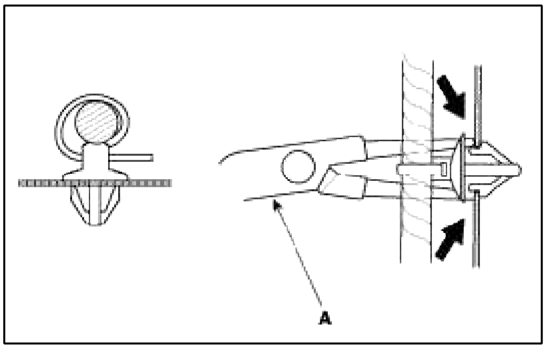


HANDLING WIRES AND HARNESSES

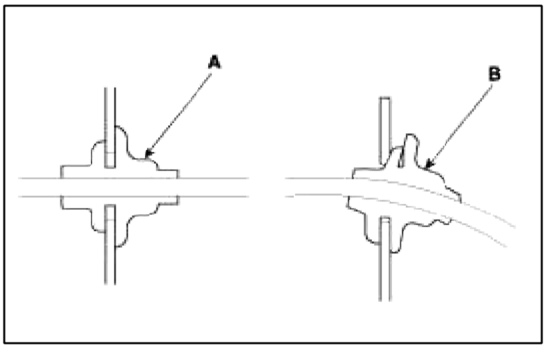
1. Secure wires and wire harnesses to the frame with their respective wire ties at the designated locations.
2. Remove clips carefully; don't damage their locks (A).



3. Slip pliers(A) under the clip base and through the hole at an angle, then squeeze the expansion tabs to release the clip.

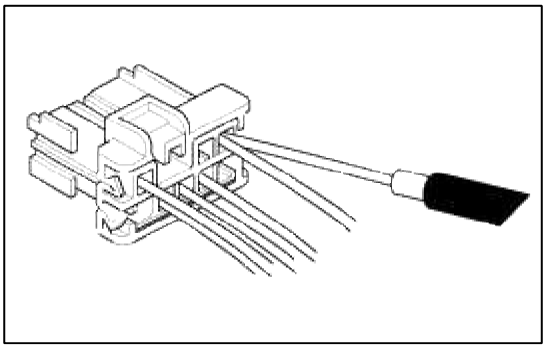


4. After installing harness clips, make sure the harness doesn't interfere with any moving parts.
5. Keep wire harnesses away from exhaust pipes and other hot parts, from sharp edges of brackets and holes, and from exposed screws and bolts.
6. Seat grommets in their grooves properly (A). Do not leave grommets distorted (B).

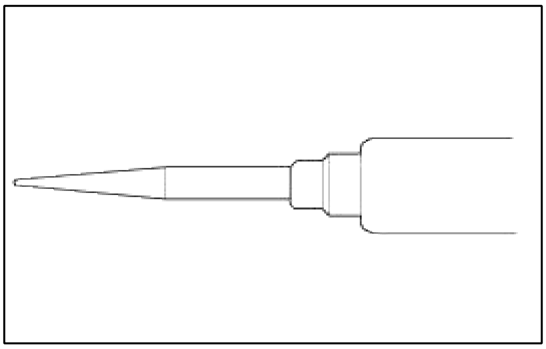


TESTING AND REPAIRS

1. Do not use wires or harnesses with broken insulation.
   Replace them or repair them by wrapping the break with electrical tape.
2. After installing parts, make sure that no wires are pinched under them.
3. When using electrical test equipment, follow the manufacturer's instructions and those described in this manual.
4. If possible, insert the probe of the tester from the wire side (except waterproof connector).



5. Use a probe with a tapered tip.

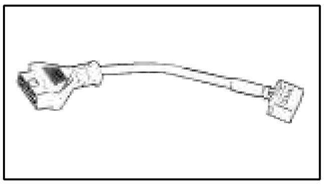


FIVE-STEP TROUBLESHOOTING

1. Verify the complaint
   Turn on all the components in the problem circuit to verify the customer complaint. Note the symptoms. Do not begin disassembly or testing until you have narrowed down the problem area.
2. Analyze the schematic
   Look up the schematic for the problem circuit.
   Determine how the circuit is supposed to work by tracing the current paths from the power feed through the circuit components to ground. If several circuits fail at the same time, the fuse or ground is a likely cause.
   Based on the symptoms and your understanding of the circuit operation, identify one or more possible causes of the problem.
3. Isolate the problem by testing the circuit
   Make circuit tests to check the diagnosis you made in step 2. Keep in mind that a logical, simple procedure is the key to efficient troubleshooting.
   Test for the most likely cause of failure first. Try to make tests at points that are easily accessible.
4. Fix the problem
   Once the specific problem is identified, make the repair. Be sure to use proper tools and safe procedures.
5. Make sure the circuit works
   Turn on all components in the repaired circuit in all modes to make sure you've fixed the entire problem. If the problem was a blown fuse, be sure to test all of the circuits on the fuse. Make sure no new problems turn up and the original problem does not recur.

Body Electrical System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09900-21300 Keyless adapter		Store transmitter code connecting the DLC (Data Link Connector) cable of Hi-scan to the multi purpose check connector.

Body Electrical System > General Information > Troubleshooting

TROUBLESHOOTING

INSTRUMENTS AND WARNING SYSTEM

Symptom	Possible cause	Remedy
Tachometer does not operate	No.2 fuse (10A) blown Tachometer faulty Wiring faulty	Check for short and replace fuse Check tachometer Repair if necessary
Fuel gauge does not operate	No.2 fuse (10A) blown Fuel gauge faulty Fuel sender faulty Wiring faulty	Check for short and replace fuse Check gauge Check fuel sender Repair if necessary
Low fuel warning lamp does not light	No.2 fuse (10A) blown Bulb burned out Fuel level sensor faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check sensor Repair if necessary
Water temperature gauge does not operate	No.2 fuse (10A) blown Water temperature gauge faulty Water temperature sender faulty Wiring or ground faulty	Check for short and replace fuse Check gauge Check sender Repair if necessary
Oil pressure warning lamp does not light	No.2 fuse (10A) blown Bulb burned out Oil pressure switch faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check switch Repair if necessary
Low brake fluid warning lamp does not light	No.2 fuse (10A) blown Bulb burned out Brake fluid level warning switch faulty Parking brake switch faulty Wiring or ground faulty	Check for short and replace fuse Replace bulb Check switch Check switch Repair if necessary
Open door warning lamp does not light	Room lamp fuse (10A) blown Battery fusible link (50A) blown Bulb burned out Door switch faulty Wiring or ground faulty	Check for short and replace fuse Replace the fusible link Replace bulb Check switch Repair if necessary
Seat belt warning lamp does not light	No.2 fuse (10A) blown Bulb burned out Buckle switch faulty Wiring or gound faulty	Check for short and replace fuse Replace bulb Check switch Repair if necessary

LIGHTING SYSTEM

Symptom	Possible cause	Remedy

One lamp does not light (all exterior)	Bulb burned out Socket, wiring or ground faulty	Replace bulb Repair if necessary
Head lamps do not light	Bulb burned out No.10 fuse (10A) blown Fusible link (50A) blown Head lamp relay faulty Lighting switch faulty Wiring or ground faulty	Replace bulb Check for short and replace fuse Replace the fusible link Check relay Check switch Repair if necessary
Tail lamps and license plate lamps do not light	Tail lamp fuse (10A) blown Battery fusible link (50A) blown Tail lamp relay faulty Lighting switch faulty Wiring or ground faulty	Replace fuse and check for short Replace the fusible link Check relay Check switch Repair if necessary
Stop lamps do not light	No.8 fuse (10A) blown Stop lamp switch faulty Wiring or ground faulty	Replace fuse and check for short Adjust or replace switch Repair if necessary
Stop lamps stay on	Stop lamp switch faulty	Adjust or replace switch
Instrument lamps do not light (Tail lamps light)	Rheostat faulty Wiring or ground faulty	Check rheostat Repair if necessary
Turn signal lamp does not flash on one side	Bulb burned out Turn signal switch faulty Wiring or ground faulty	Replace bulb Check switch Repair if necessary
Turn signal lamps do not operate	No.1 fuse (10A) blown Flasher unit faulty Turn signal switch faulty Wiring or ground faulty	Replace fuse and check for short Check flasher unit Check switch Repair if necessary
Hazard warning lamps do not operate	No.7 fuse (10A) blown Flasher unit faulty Hazard switch faulty Hazard relay faulty Wiring or ground faulty	Replace fuse and check for short Check flasher unit Check switch Replace relay Repair if necessary
Flasher rate too slow or too fast	Lamps' wattages are smaller or larger than specified Defective flasher unit	Replace lamps Check flasher unit
Back up lamps do not light up	No.5 fuse (10A) blown Back up lamp switch faulty Wiring or ground faulty	Replace fuse and check for short Check switch Repair if necessary
Room lamp does not light up	Room lamp fuse (10A) blown Wiring or ground faulty	Replace fuse and check for short Repair if necessary

AUDIO

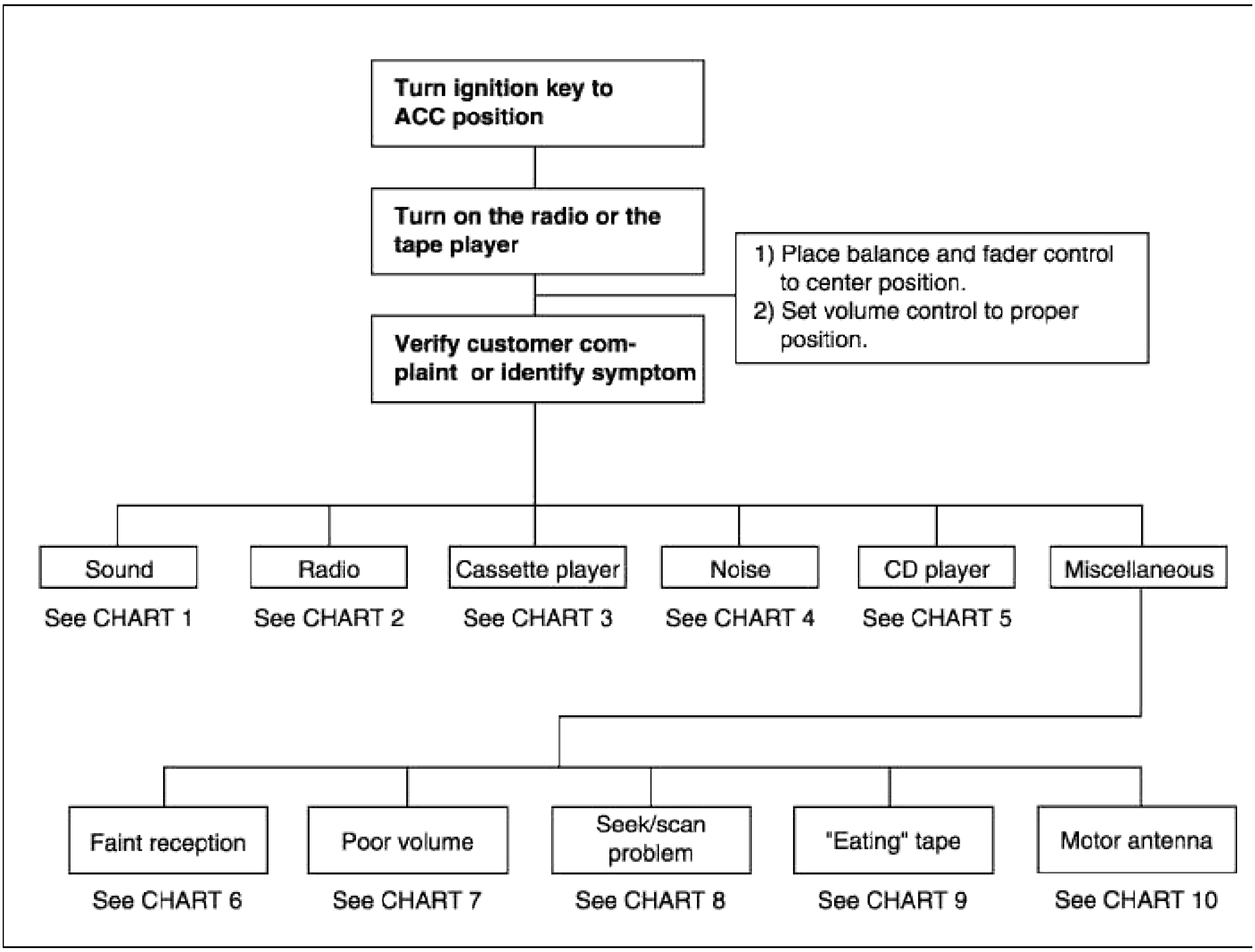
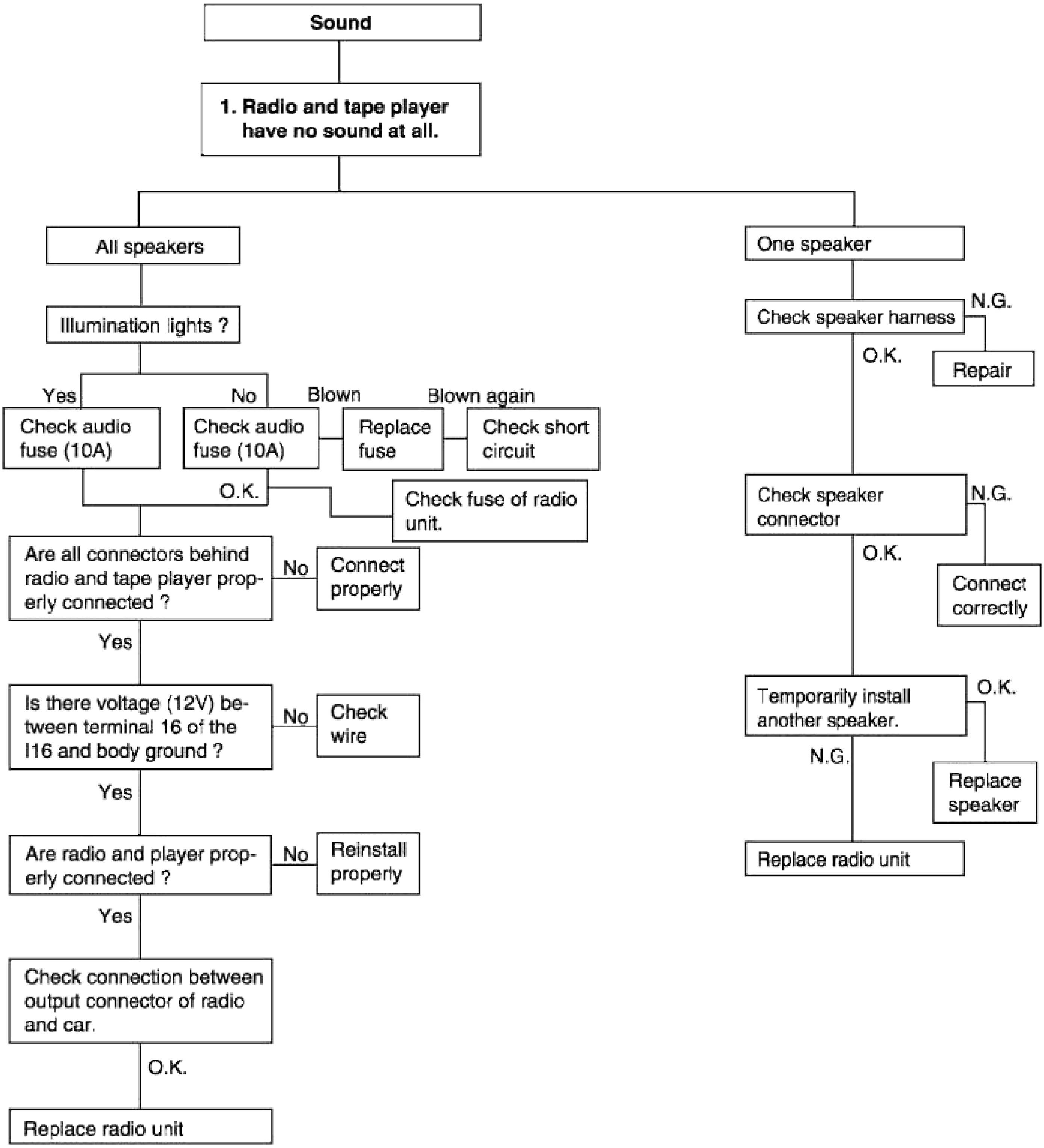

Turn ignition key to ACC position
Turn on the radio or the tape player
1) Place balance and fader control to center position.
2) Set volume control to proper position.
Verify customer complaint or identify symptom
Sound
See CHART 1
Radio
See CHART 2
Cassette player
See CHART 3
Noise
See CHART 4
CD player
See CHART 5
Miscellaneous
Faint reception
See CHART 6
Poor volume
See CHART 7
Seek/scan problem
See CHART 8
"Eating" tape
See CHART 9
Motor antenna
See CHART 10

CHART 1


Sound
1. Radio and tape player have no sound at all.
All speakers
Illumination lights ?
Yes
No
Check audio fuse (10A)
Check audio fuse (10A)
Blown
Replace fuse
Blown again
Check short circuit
O.K.
Check fuse of radio unit.
Are all connectors behind radio and tape player properly connected ?
No
Connect properly
Yes
Is there voltage (12V) between terminal 16 of the I16 and body ground ?
No
Check wire
Yes
Are radio and player properly connected ?
No
Reinstall properly
Yes
Check connection between output connector of radio and car.
O.K.
Replace radio unit
One speaker
Check speaker harness
N.G.
Repair
O.K.
Check speaker connector
N.G.
Connect correctly
O.K.
Temporarily install another speaker.
O.K.
Replace speaker
N.G.
Replace radio unit

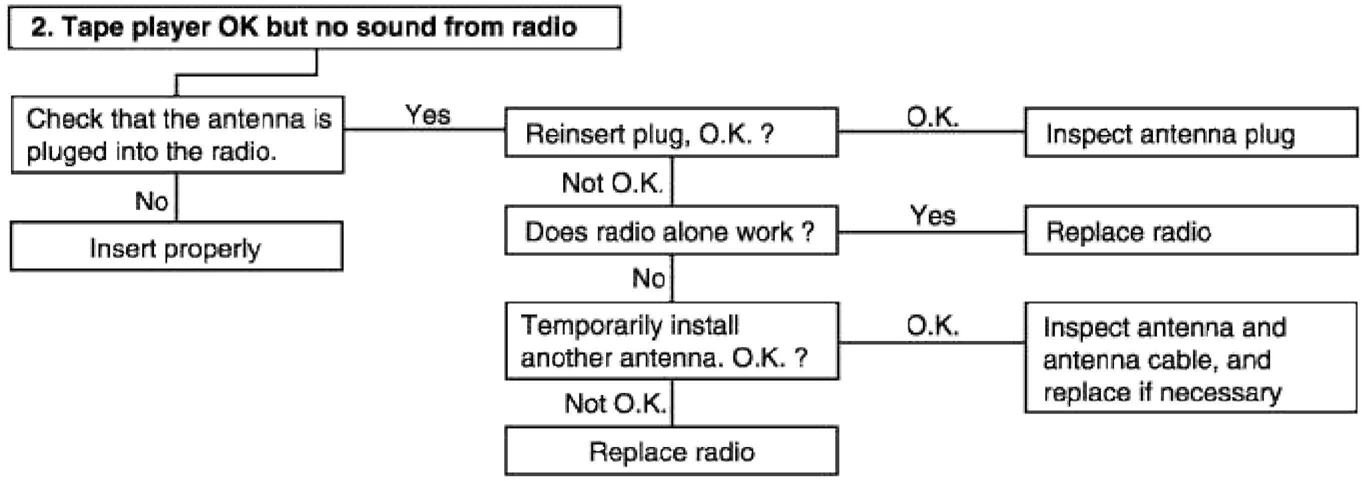

2. Tape player OK but no sound from radio
Check that the antenna is pluged into the radio.
No
Insert properly
Yes
Reinsert plug, O.K. ?
O.K.
Inspect antenna plug
Not O.K.
Does radio alone work ?
Yes
Replace radio
No
Temporarily install another antenna. O.K. ?
O.K.
Inspect antenna and antenna cable, and replace if necessary
Not O.K.
Replace radio

CHART 2

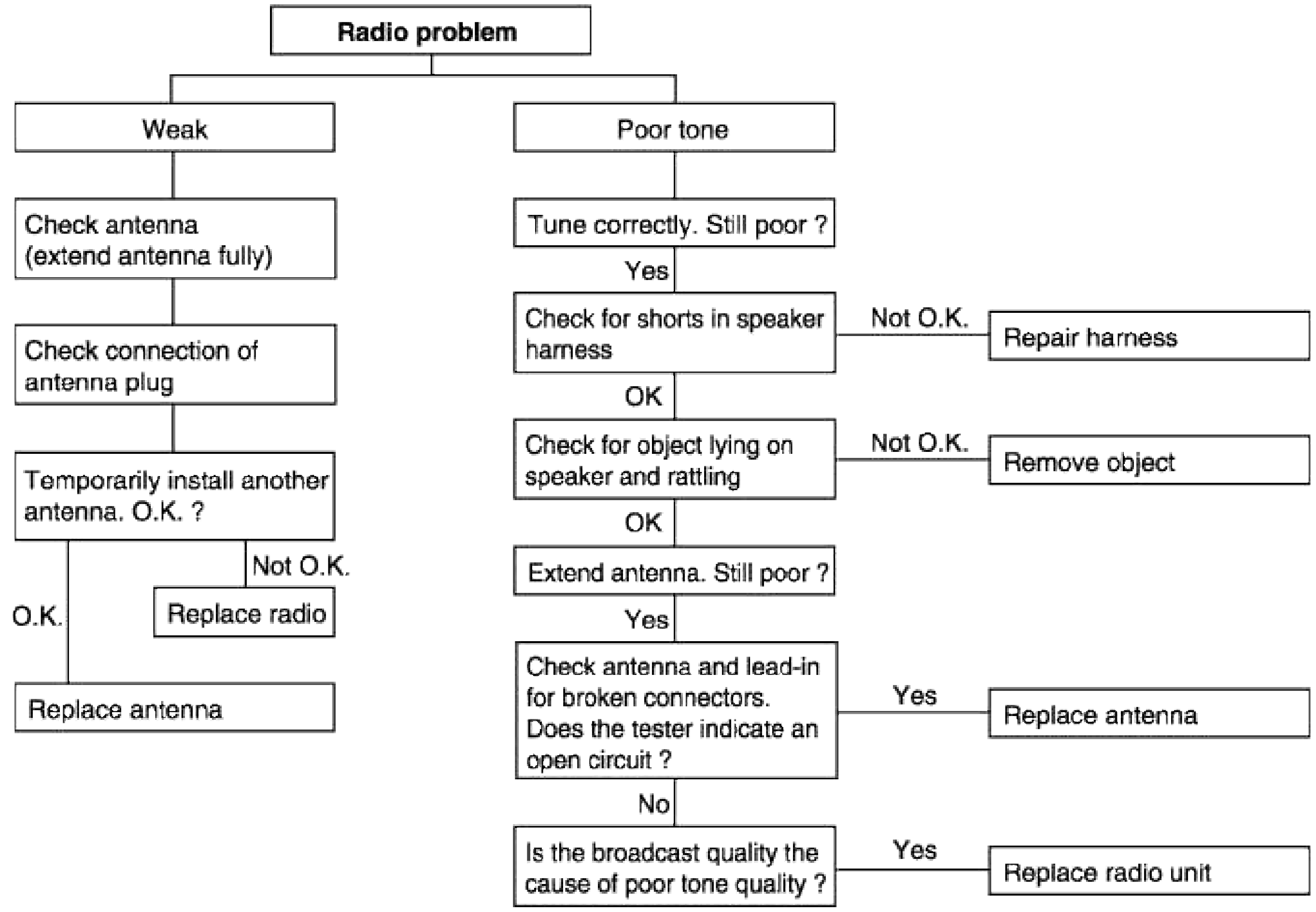

Radio problem
Weak
Check antenna (extend antenna fully)
Check connection of antenna plug
Temporarily install another antenna. O.K. ?
Not O.K.
Replace radio
O.K.
Replace antenna
Poor tone
Tune correctly. Still poor ?
Yes
Check for shorts in speaker harness
Not O.K.
Repair harness
OK
Check for object lying on speaker and rattling
Not O.K.
Remove object
OK
Extend antenna. Still poor ?
Yes
Check antenna and lead-in for broken connectors. Does the tester indicate an open circuit ?
Yes
Replace antenna
No
Is the broadcast quality the cause of poor tone quality ?
Yes
Replace radio unit

CHART 3

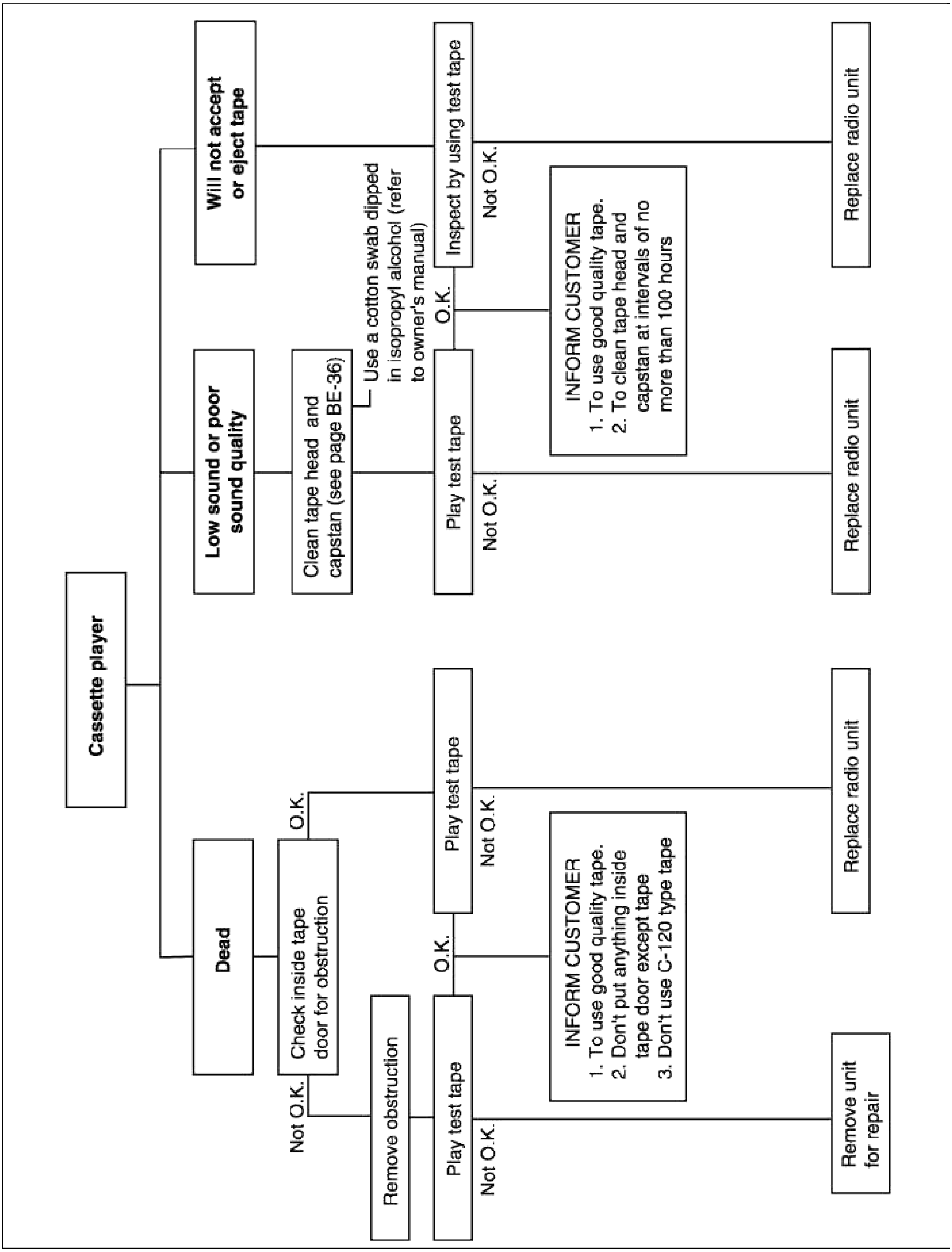
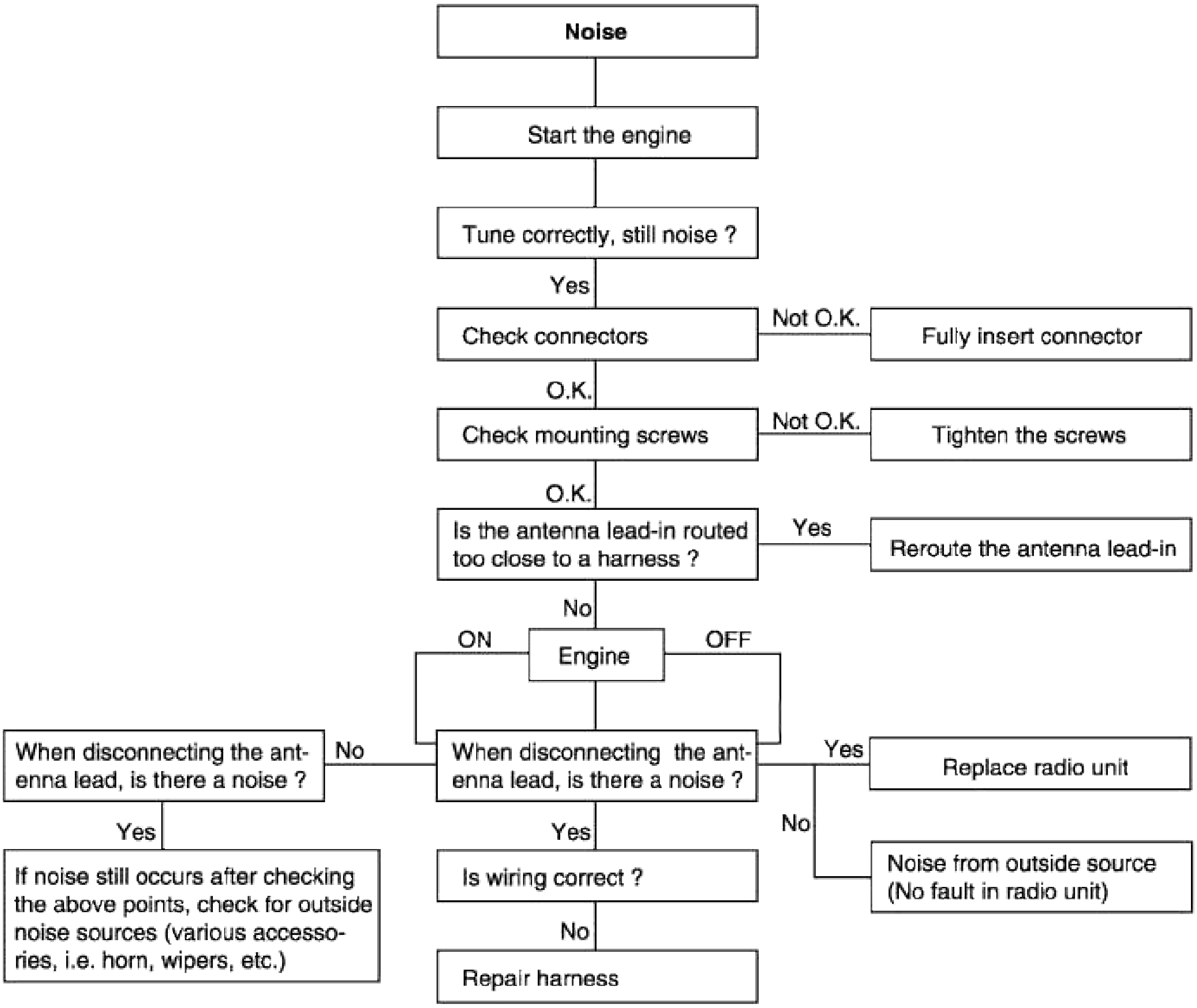

Cassette player
Dead
Low sound or poor sound quality
Will not accept or eject tape
Check inside tape door for obstruction
Not O.K.
O.K.
Remove obstruction
Play test tape
Not O.K.
O.K.
Play test tape
Not O.K.
INFORM CUSTOMER
1. To use good quality tape.
2. Don't put anything inside tape door except tape
3. Don't use C-120 type tape
Remove unit for repair
Replace radio unit
Clean tape head and capstan (see page BE-36)
Use a cotton swab dipped in isopropyl alcohol (refer to owner's manual)
Play test tape
Not O.K.
O.K.
INFORM CUSTOMER
1. To use good quality tape.
2. To clean tape head and capstan at intervals of no more than 100 hours
Replace radio unit
Inspect by using test tape
Not O.K.
Replace radio unit

CHART 4

1. RADIO


Noise
Start the engine
Tune correctly, still noise ?
Yes
Check connectors
Not O.K.
Fully insert connector
O.K.
Check mounting screws
Not O.K.
Tighten the screws
O.K.
Is the antenna lead-in routed too close to a harness ?
Yes
Reroute the antenna lead-in
No
ON
Engine
OFF
When disconnecting the antenna lead, is there a noise ?
No
When disconnecting the antenna lead, is there a noise ?
Yes
Replace radio unit
No
Noise from outside source (No fault in radio unit)
Yes
If noise still occurs after checking the above points, check for outside noise sources (various accessories, i.e. horn, wipers, etc.)
Yes
Is wiring correct ?
No
Repair harness

2. TAPE

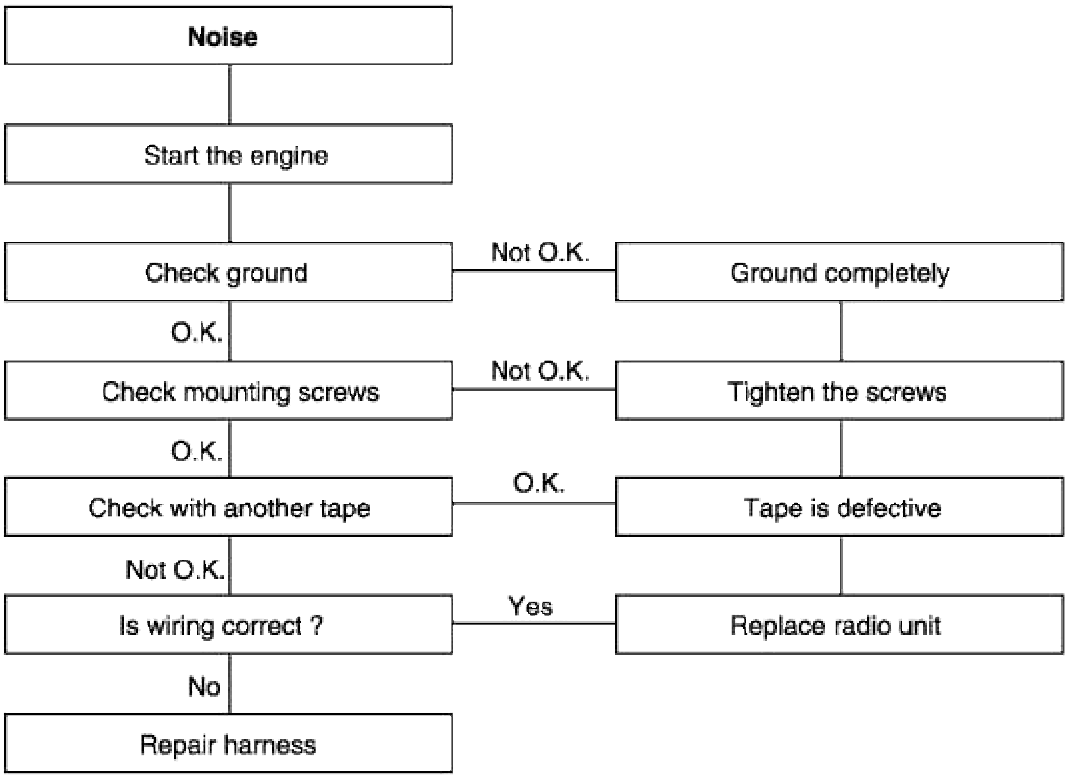
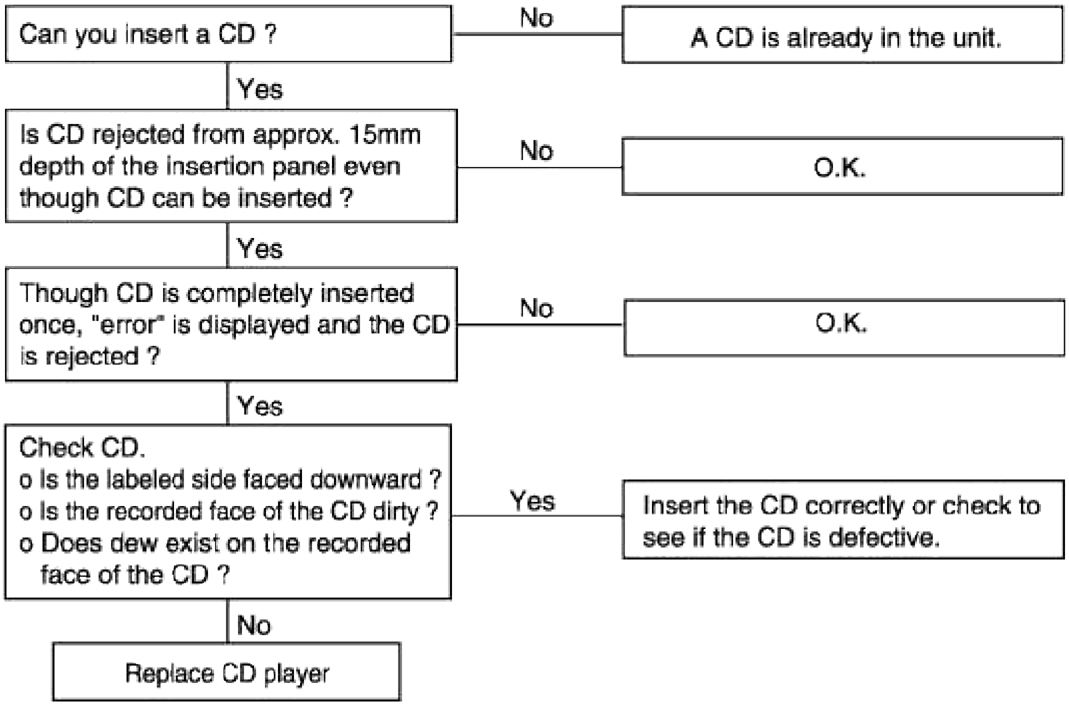
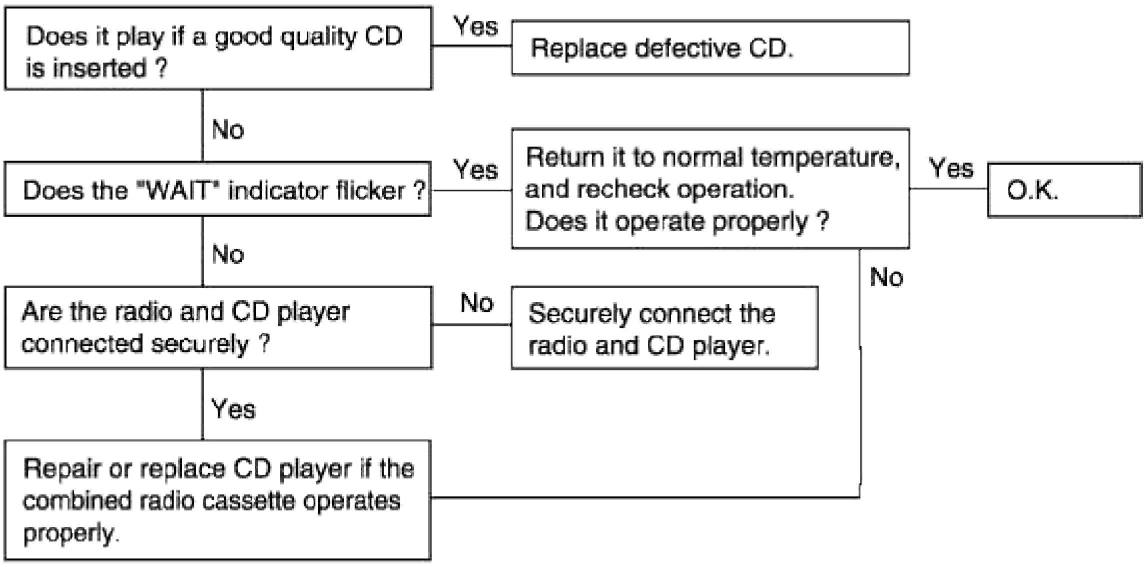

Noise
Start the engine
Check ground
Not O.K.
Ground completely
O.K.
Check mounting screws
Not O.K.
Tighten the screws
O.K.
Check with another tape
O.K.
Tape is defective
Not O.K.
Is wiring correct ?
Yes
Replace radio unit
No
Repair harness

CHART 5

1. CD WILL NOT BE ACCEPTED

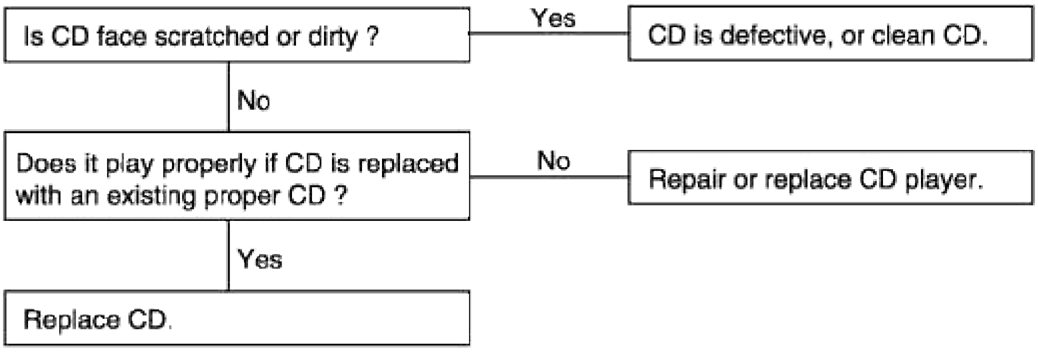

Can you insert a CD ?
No
A CD is already in the unit.
Yes
Is CD rejected from approx. 15mm depth of the insertion panel even though CD can be inserted ?
No
O.K.
Yes
Though CD is completely inserted once, "error" is displayed and the CD is rejected ?
No
O.K.
Yes
Check CD.
o Is the labeled side faced downward ?
o Is the recorded face of the CD dirty ?
o Does dew exist on the recorded face of the CD ?
Yes
Insert the CD correctly or check to see if the CD is defective.
No
Replace CD player

2. NO SOUND

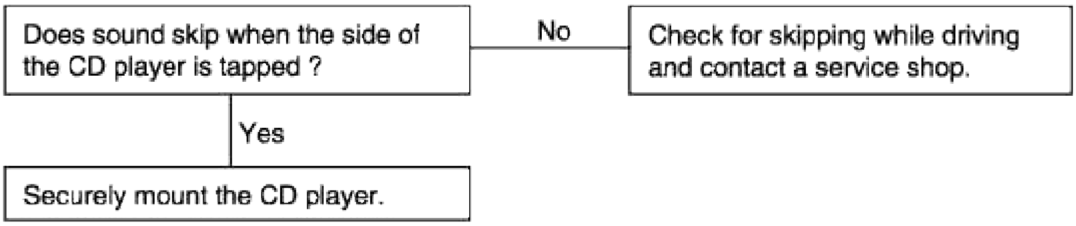

Does it play if a good quality CD is inserted ?
Yes
Replace defective CD.
No
Does the "WAIT" indicator flicker ?
Yes
Return it to normal temperature, and recheck operation. Does it operate properly ?
Yes
O.K.
No
No
Are the radio and CD player connected securely ?
No
Securely connect the radio and CD player.
Yes
Repair or replace CD player if the combined radio cassette operates properly.

3. CD SOUND SKIPS

1) Sound sometimes skips when parking.


Is CD face scratched or dirty ?
Yes
CD is defective, or clean CD.
No
Does it play properly if CD is replaced with an existing proper CD ?
No
Repair or replace CD player.
Yes
Replace CD.

2) Sound sometimes skips when driving.
(Stop vehicle, and check it.)
(Check by using a CD which is free of scratches, dirt or other damage.)


Does sound skip when the side of the CD player is tapped ?
No
Check for skipping while driving and contact a service shop.
Yes
Securely mount the CD player.

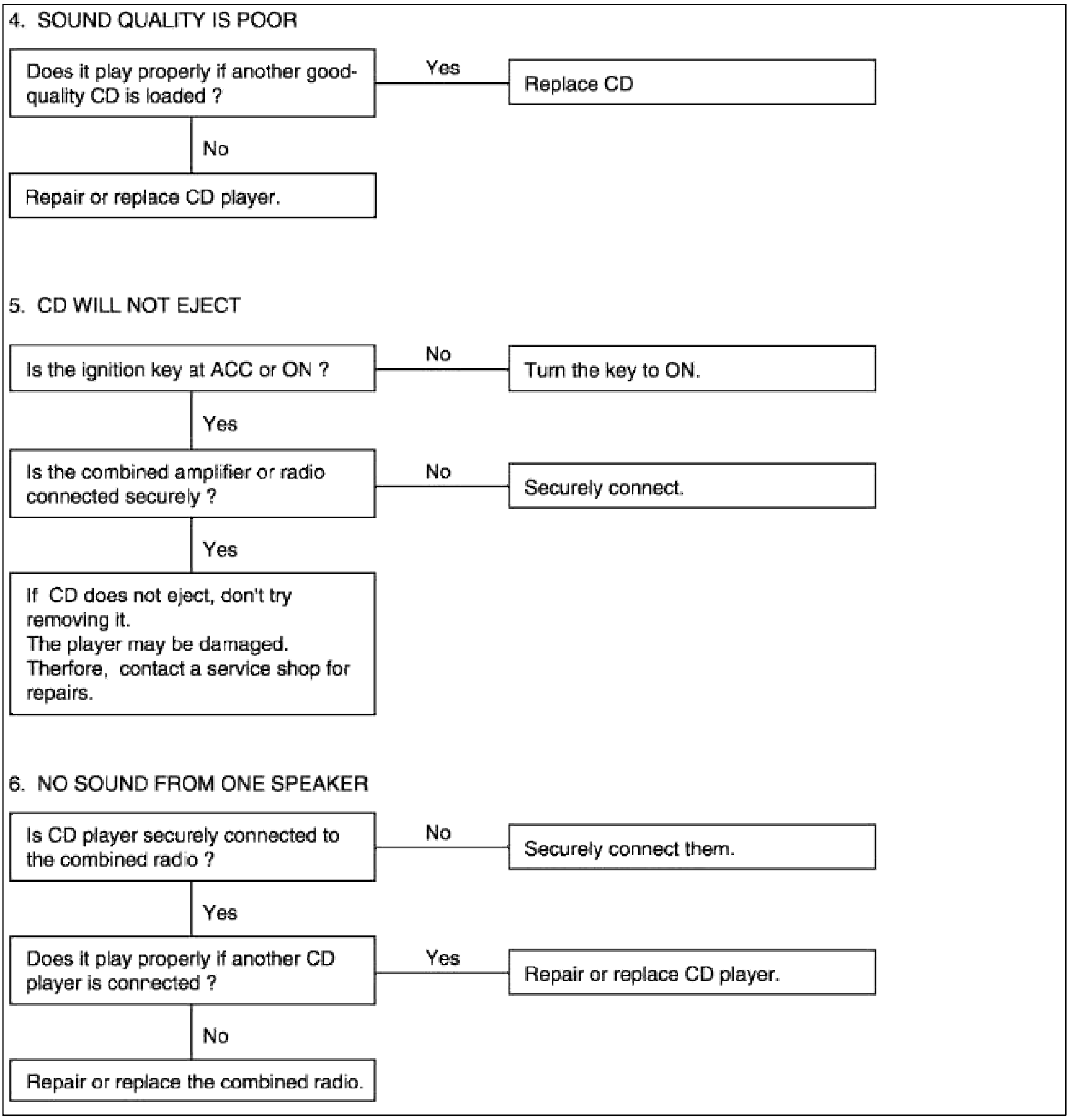

4. SOUND QUALITY IS POOR
Does it play properly if another good-quality CD is loaded ?
Yes
Replace CD
No
Repair or replace CD player.
5. CD WILL NOT EJECT
Is the ignition key at ACC or ON ?
No
Turn the key to ON.
Yes
Is the combined amplifier or radio connected securely ?
No
Securely connect.
Yes
If CD does not eject, don't try removing it. The player may be damaged. Therfore, contact a service shop for repairs.
6. NO SOUND FROM ONE SPEAKER
Is CD player securely connected to the combined radio ?
No
Securely connect them.
Yes
Does it play properly if another CD player is connected ?
Yes
Repair or replace CD player.
No
Repair or replace the combined radio.

CHART 6

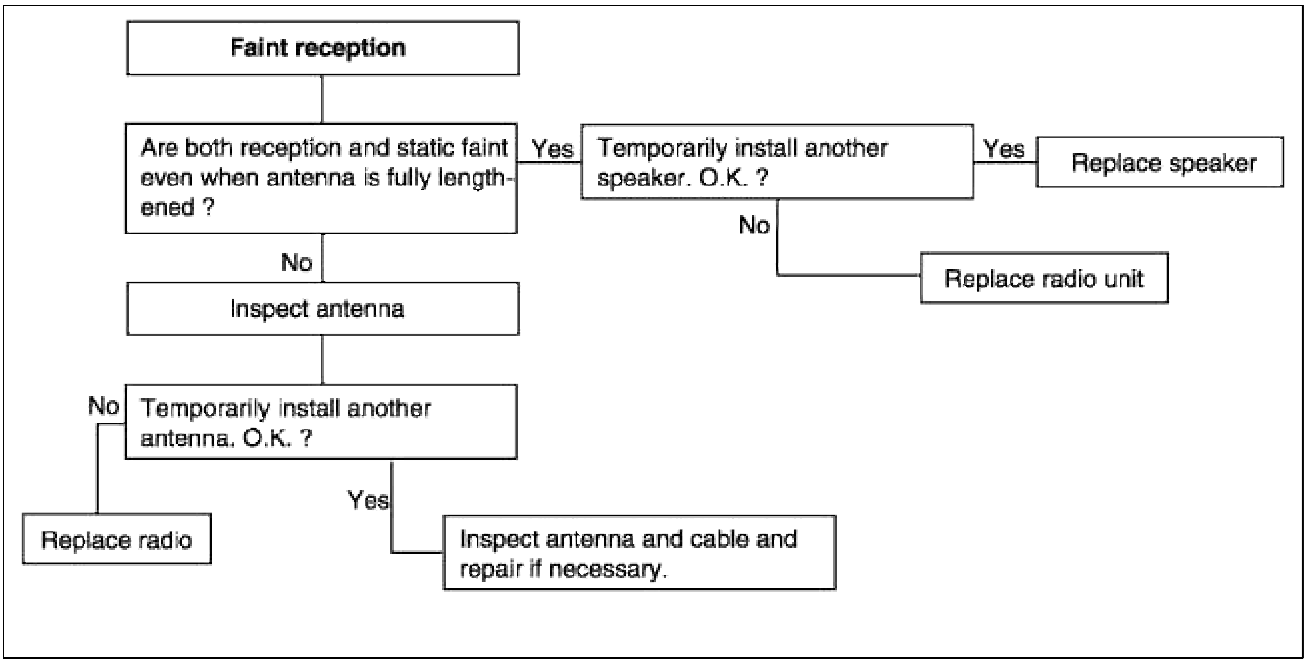

Faint reception
Are both reception and static faint even when antenna is fully lengthened ?
Yes
Temporarily install another speaker. O.K. ?
Yes
Replace speaker
No
Replace radio unit
No
Inspect antenna
No
Temporarily install another antenna. O.K. ?
Replace radio
Yes
Inspect antenna and cable and repair if necessary.

CHART 7

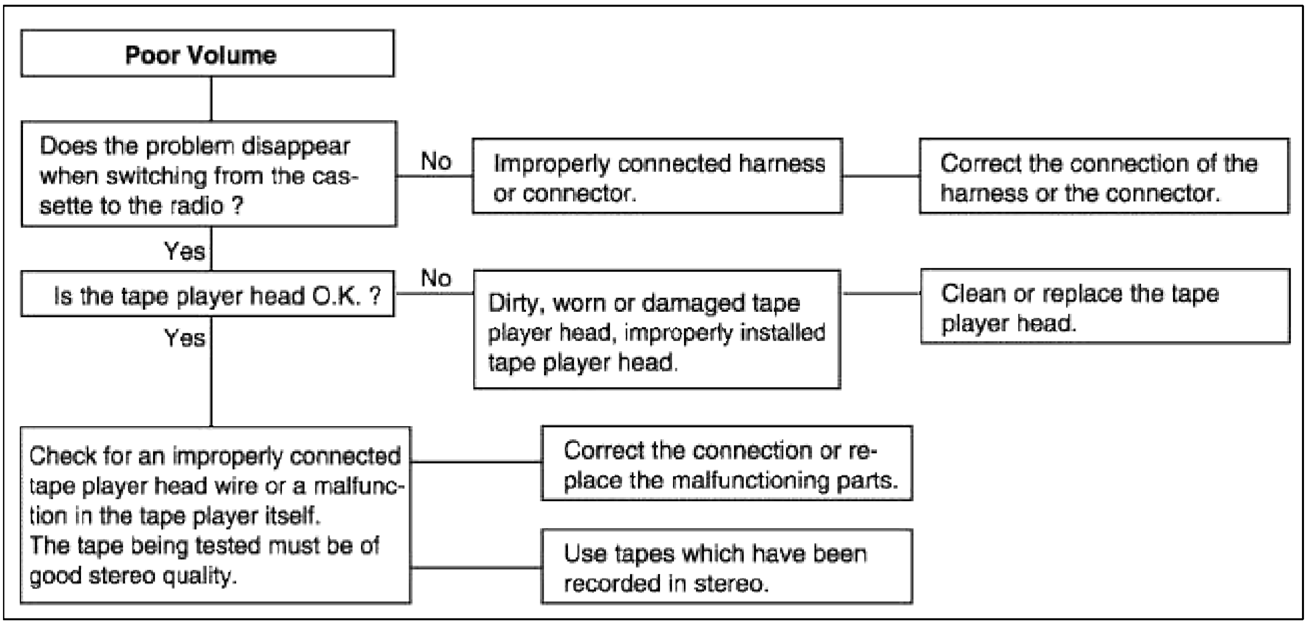

Poor Volume
Does the problem disappear when switching from the cassette to the radio ?
No
Improperly connected harness or connector.
Correct the connection of the harness or the connector.
Yes
Is the tape player head O.K. ?
No
Dirty, worn or damaged tape player head, improperly installed tape player head.
Clean or replace the tape player head.
Yes
Check for an improperly connected tape player head wire or a malfunction in the tape player itself.
The tape being tested must be of good stereo quality.
Correct the connection or replace the malfunctioning parts.
Use tapes which have been recorded in stereo.

CHART 8

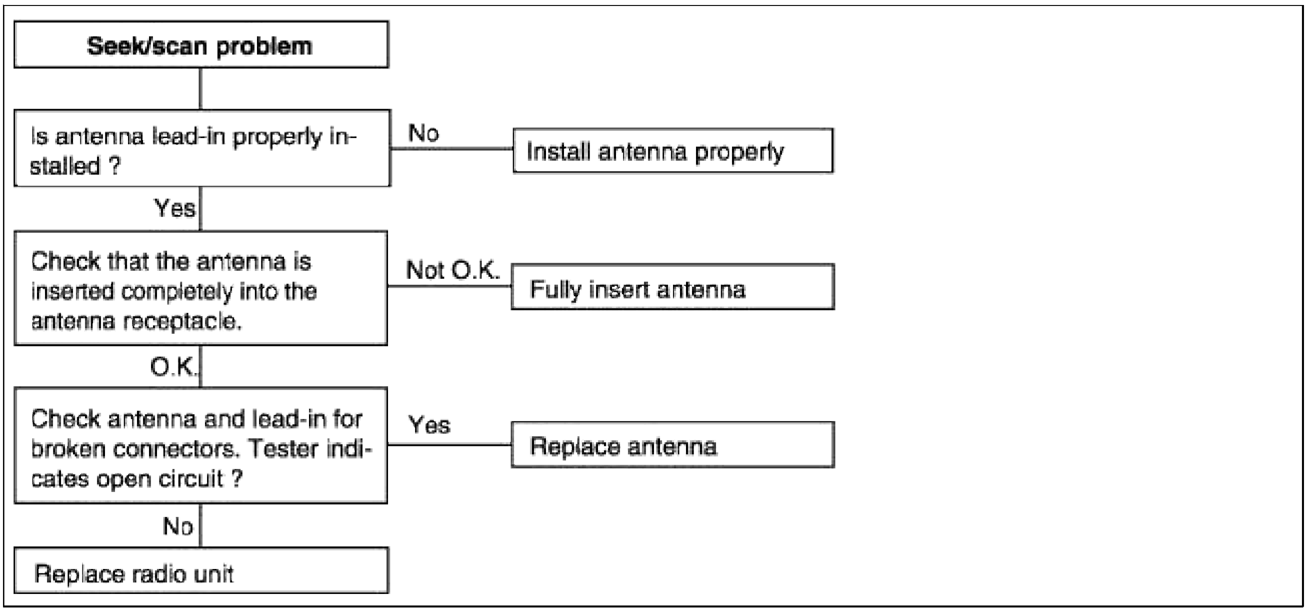

Seek/scan problem
Is antenna lead-in properly installed ?
No
Install antenna properly
Yes
Check that the antenna is inserted completely into the antenna receptacle.
Not O.K.
Fully insert antenna
O.K.
Check antenna and lead-in for broken connectors. Tester indicates open circuit ?
Yes
Replace antenna
No
Replace radio unit

CHART 9

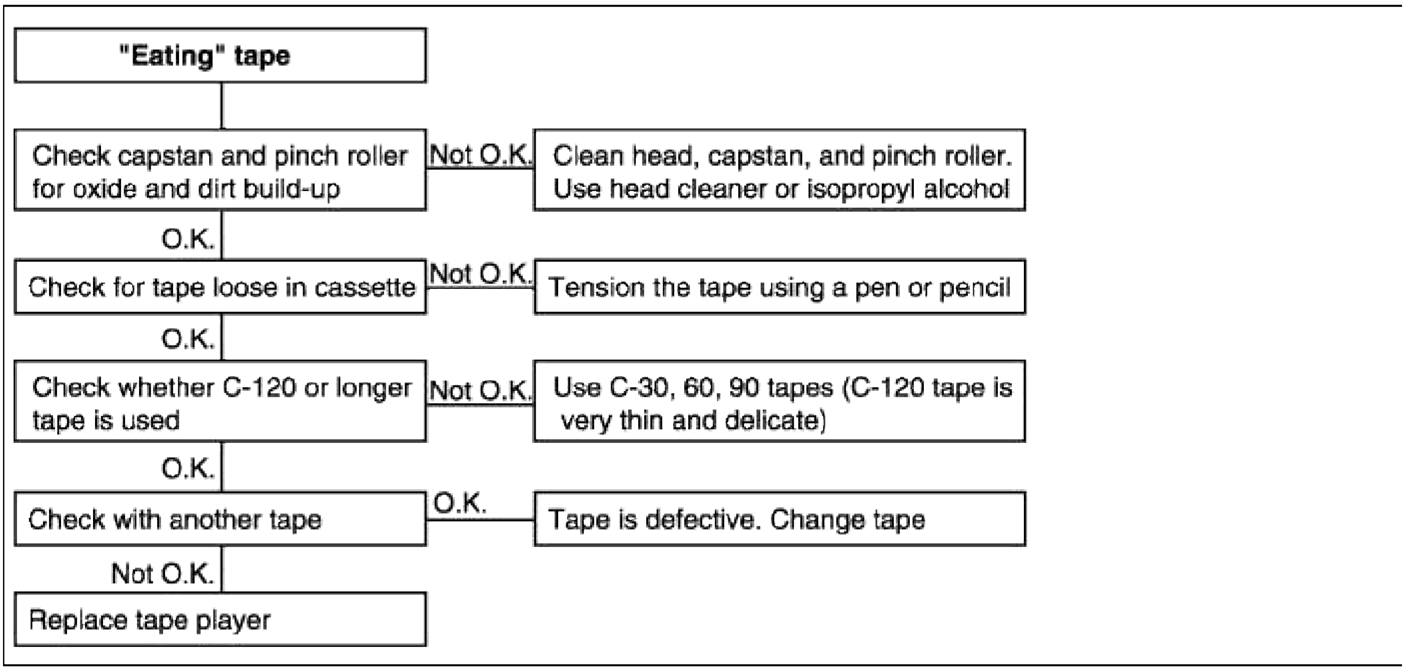
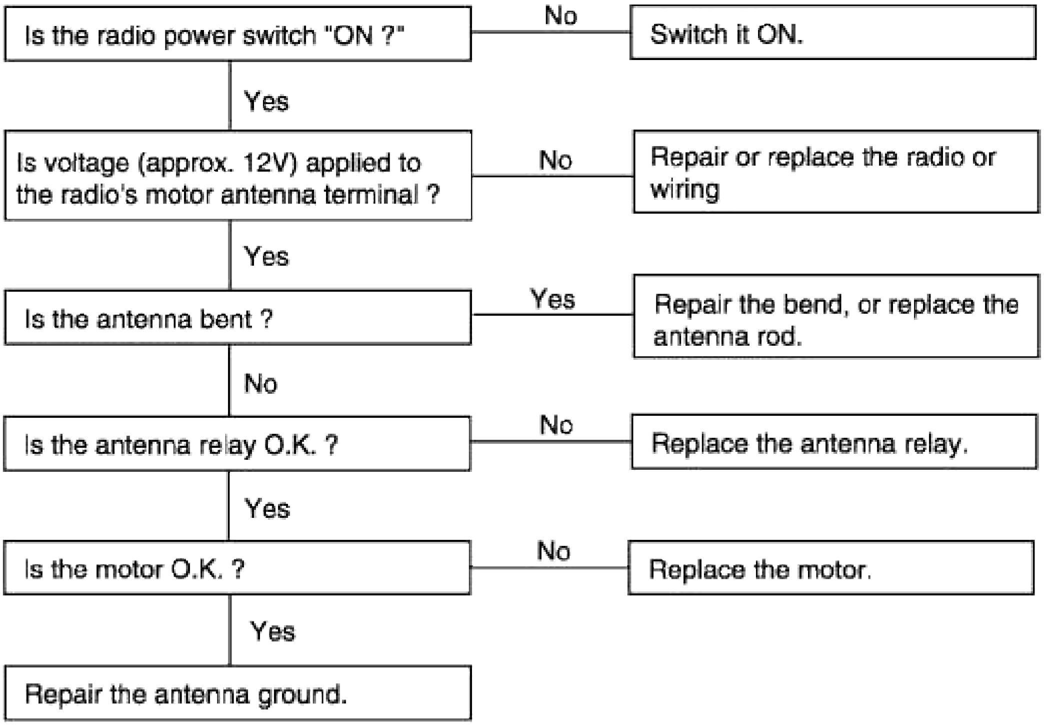

"Eating" tape
Check capstan and pinch roller for oxide and dirt build-up
Not O.K.
Clean head, capstan, and pinch roller. Use head cleaner or isopropyl alcohol
O.K.
Check for tape loose in cassette
Not O.K.
Tension the tape using a pen or pencil
O.K.
Check whether C-120 or longer tape is used
Not O.K.
Use C-30, 60, 90 tapes (C-120 tape is very thin and delicate)
O.K.
Check with another tape
O.K.
Tape is defective. Change tape
Not O.K.
Replace tape player

CHART 10

1. MOTOR ANTENNA WON'T EXTEND OR RETRACT

Clean and polish the surface of the antenna rod.



Is the radio power switch "ON ?" — No → Switch it ON.

Yes ↓

Is voltage (approx. 12V) applied to the radio's motor antenna terminal ? — No → Repair or replace the radio or wiring

Yes ↓

Is the antenna bent ? — Yes → Repair the bend, or replace the antenna rod.

No ↓

Is the antenna relay O.K. ? — No → Replace the antenna relay.

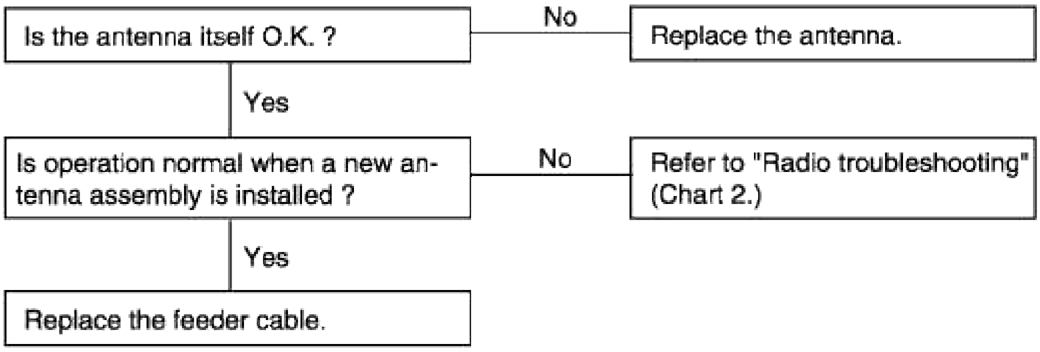
Yes ↓

Is the motor O.K. ? — No → Replace the motor.

Yes ↓

Repair the antenna ground.

2. MOTOR ANTENNA EXTENDS AND RETRACTS BUT DOES NOT RECEIVE



Is the antenna itself O.K. ? — No → Replace the antenna.

Yes ↓

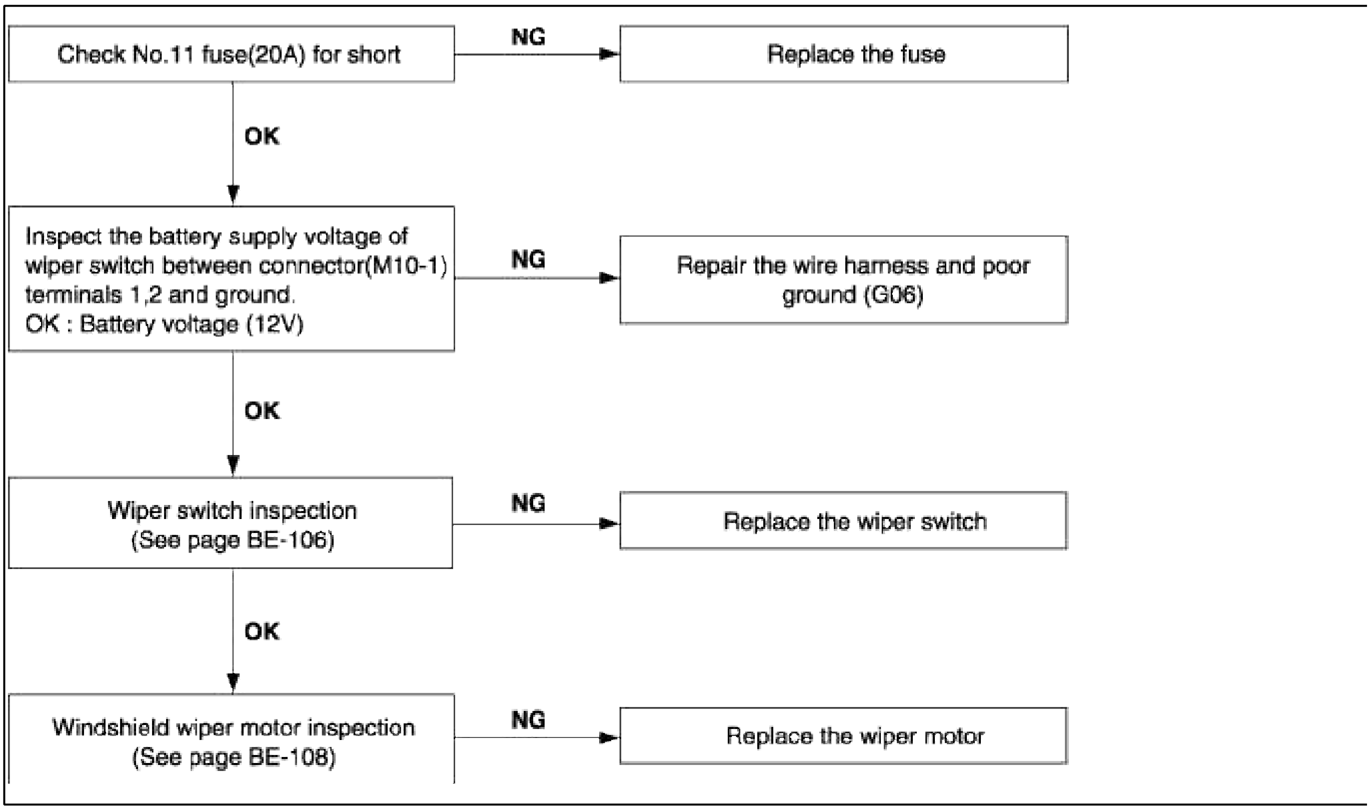
Is operation normal when a new antenna assembly is installed ? — No → Refer to "Radio troubleshooting" (Chart 2.)

Yes ↓

Replace the feeder cable.

WINDSHIELD WIPER

1. Wiper low and wiper high does not work.



Check No.11 fuse(20A) for short

Replace the fuse

Inspect the battery supply voltage of wiper switch between connector(M10-1) terminals 1,2 and ground.
OK : Battery voltage (12V)

Repair the wire harness and poor ground (G06)

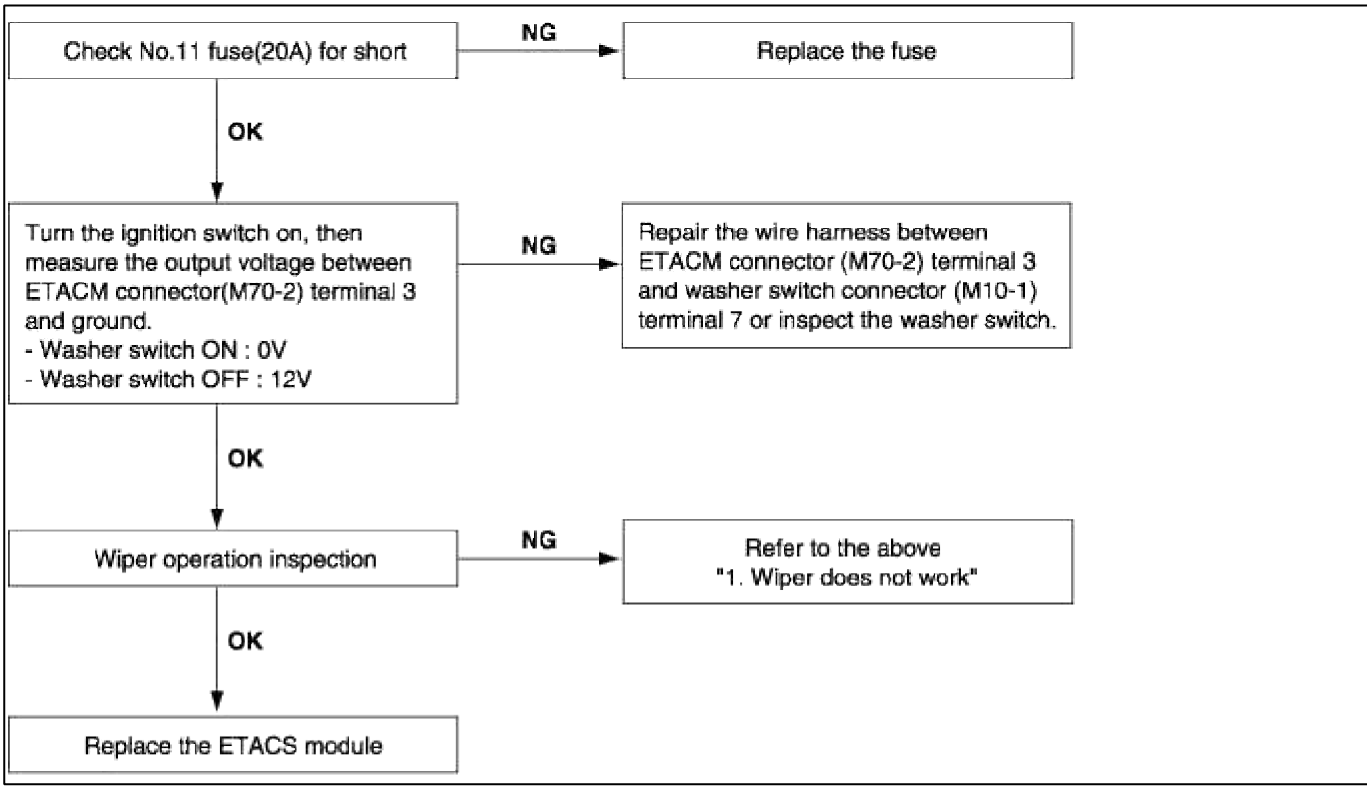
Wiper switch inspection (See page BE-106)

Replace the wiper switch

Windshield wiper motor inspection (See page BE-108)

Replace the wiper motor

2. When washer switch is on, wiper does not work.



Check No.11 fuse(20A) for short

Replace the fuse

Turn the ignition switch on, then measure the output voltage between ETACM connector(M70-2) terminal 3 and ground.
- Washer switch ON : 0V
- Washer switch OFF : 12V

Repair the wire harness between ETACM connector (M70-2) terminal 3 and washer switch connector (M10-1) terminal 7 or inspect the washer switch.

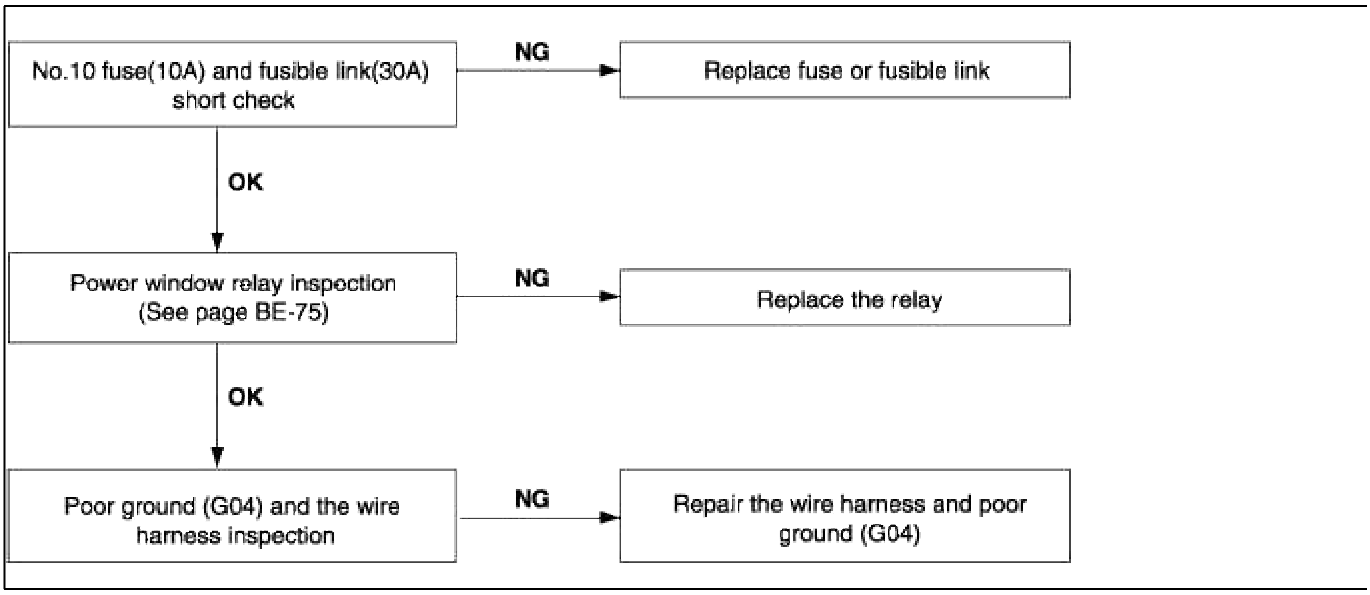
Wiper operation inspection

Refer to the above "1. Wiper does not work"

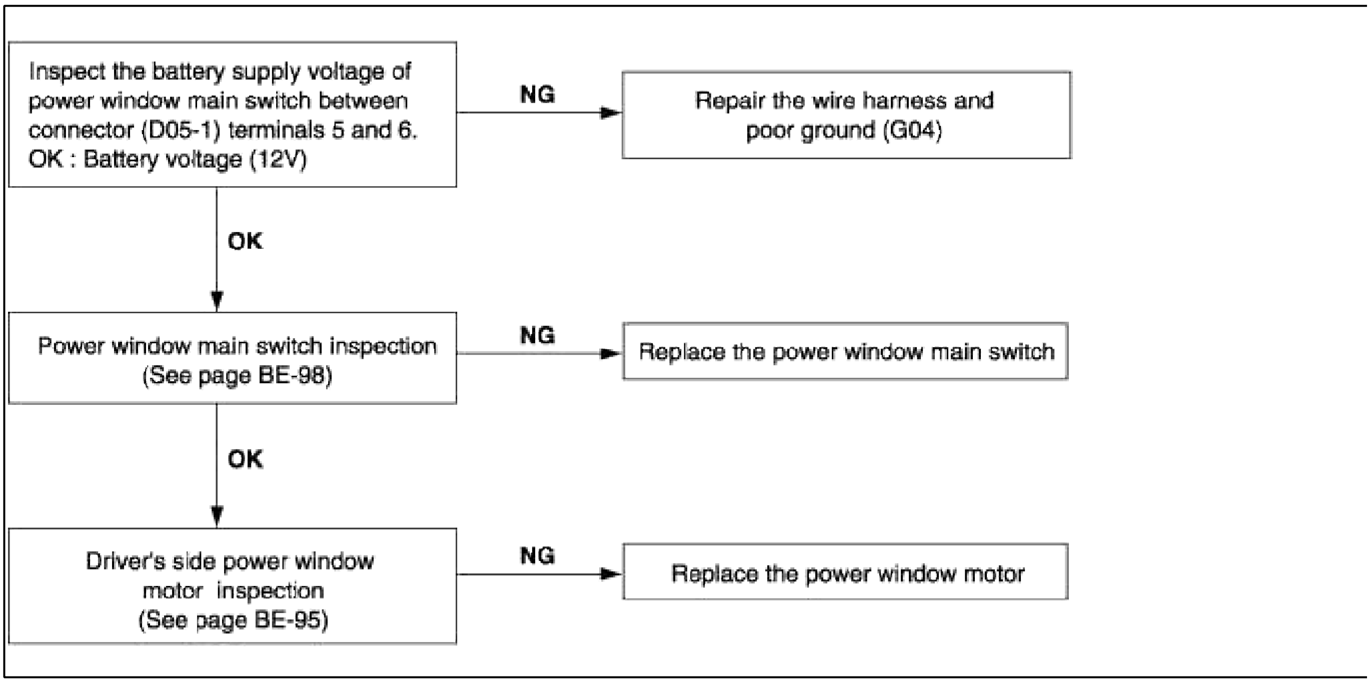
Replace the ETACS module

POWER WINDOW

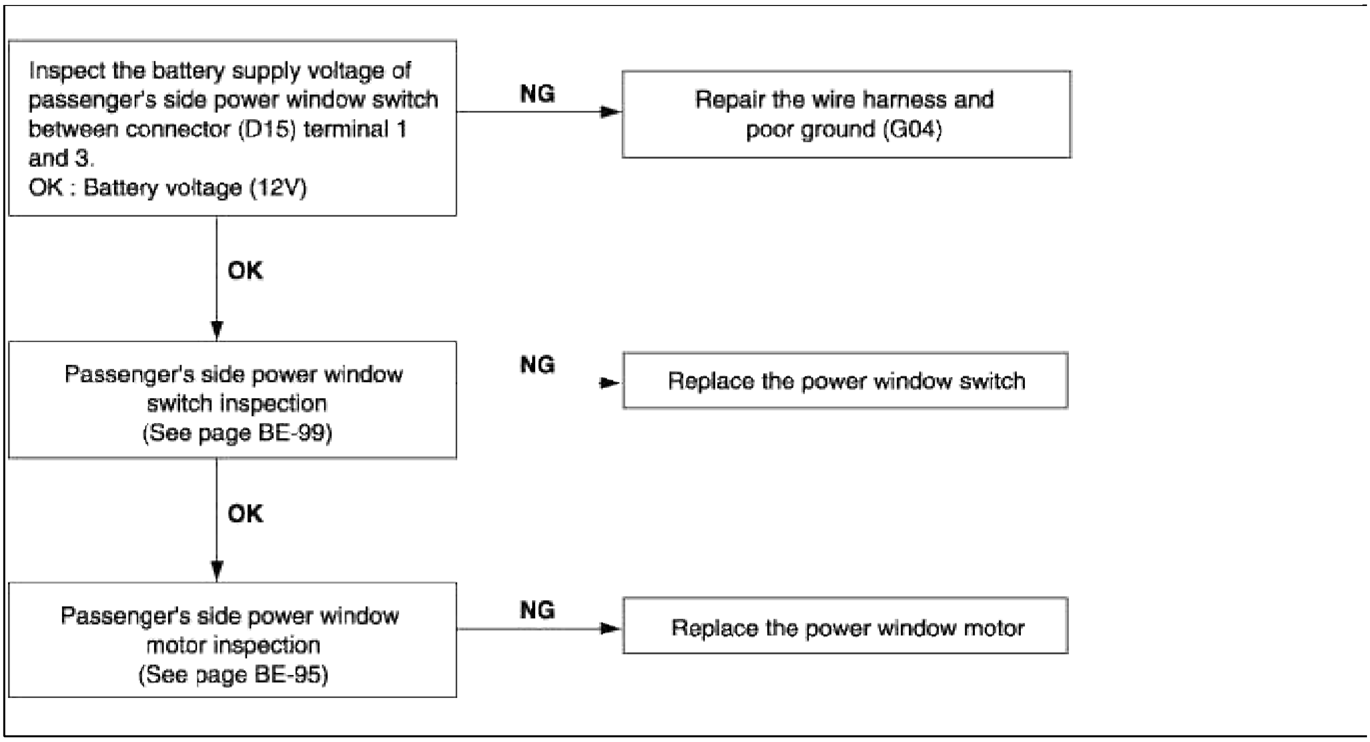
1. No windows operate from the main switch on the driver's door.


No.10 fuse(10A) and fusible link(30A) short check
NG
Replace fuse or fusible link
OK
Power window relay inspection (See page BE-75)
NG
Replace the relay
OK
Poor ground (G04) and the wire harness inspection
NG
Repair the wire harness and poor ground (G04)

2. Driver's side window does not operate.

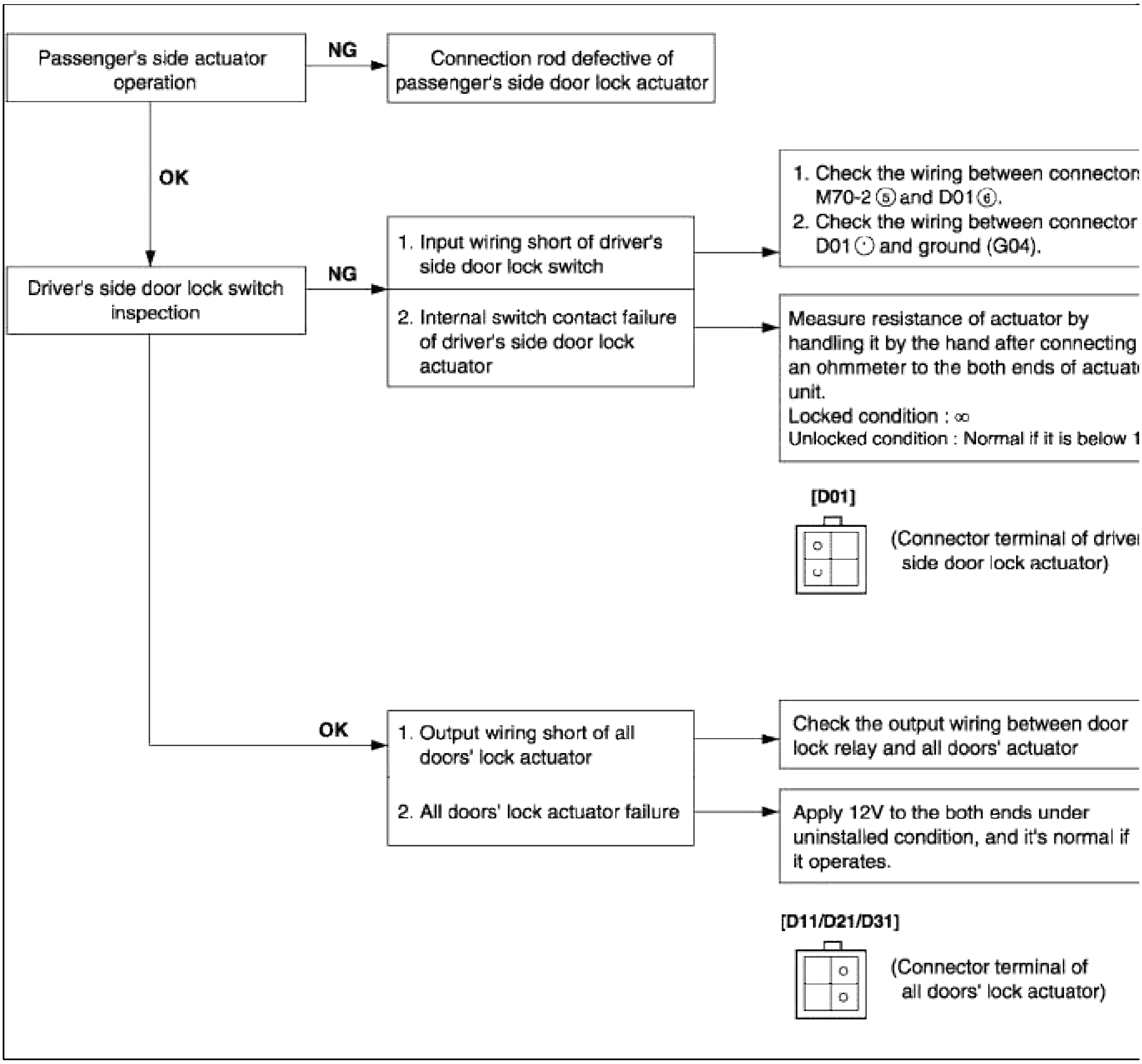

Inspect the battery supply voltage of power window main switch between connector (D05-1) terminals 5 and 6.
OK : Battery voltage (12V)
NG
Repair the wire harness and poor ground (G04)
OK
Power window main switch inspection (See page BE-98)
NG
Replace the power window main switch
OK
Driver's side power window motor inspection (See page BE-95)
NG
Replace the power window motor

3. Passenger's side window does not operate.


Inspect the battery supply voltage of passenger's side power window switch between connector (D15) terminal 1 and 3.
OK : Battery voltage (12V)
NG
Repair the wire harness and poor ground (G04)
OK
Passenger's side power window switch inspection (See page BE-99)
NG
Replace the power window switch
OK
Passenger's side power window motor inspection (See page BE-95)
NG
Replace the power window motor

POWER DOOR LOCK

1. Lock function works but unlock function does not interlock.
   → Since door unlock relay has failed, replace the door unlock relay.
2. Unlock function works but lock function does not interlock.
   → Since door lock relay has failed, replace the door lock relay.
3. When passenger side knob is controlled, all doors interlock, but when driver side knob is controlled, all doors do interlock.



Passenger's side actuator operation

NG → Connection rod defective of passenger's side door lock actuator

OK ↓

Driver's side door lock switch inspection

NG →

1. Input wiring short of driver's side door lock switch
2. Internal switch contact failure of driver's side door lock actuator

1. Check the wiring between connector M70-2 ⑤ and D01 ⑥.
2. Check the wiring between connector D01 ⊙ and ground (G04).

Measure resistance of actuator by handling it by the hand after connecting an ohmmeter to the both ends of actuat unit.
Locked condition : ∞
Unlocked condition : Normal if it is below 1

[D01]

(Connector terminal of drive side door lock actuator)

OK →

1. Output wiring short of all doors' lock actuator
2. All doors' lock actuator failure

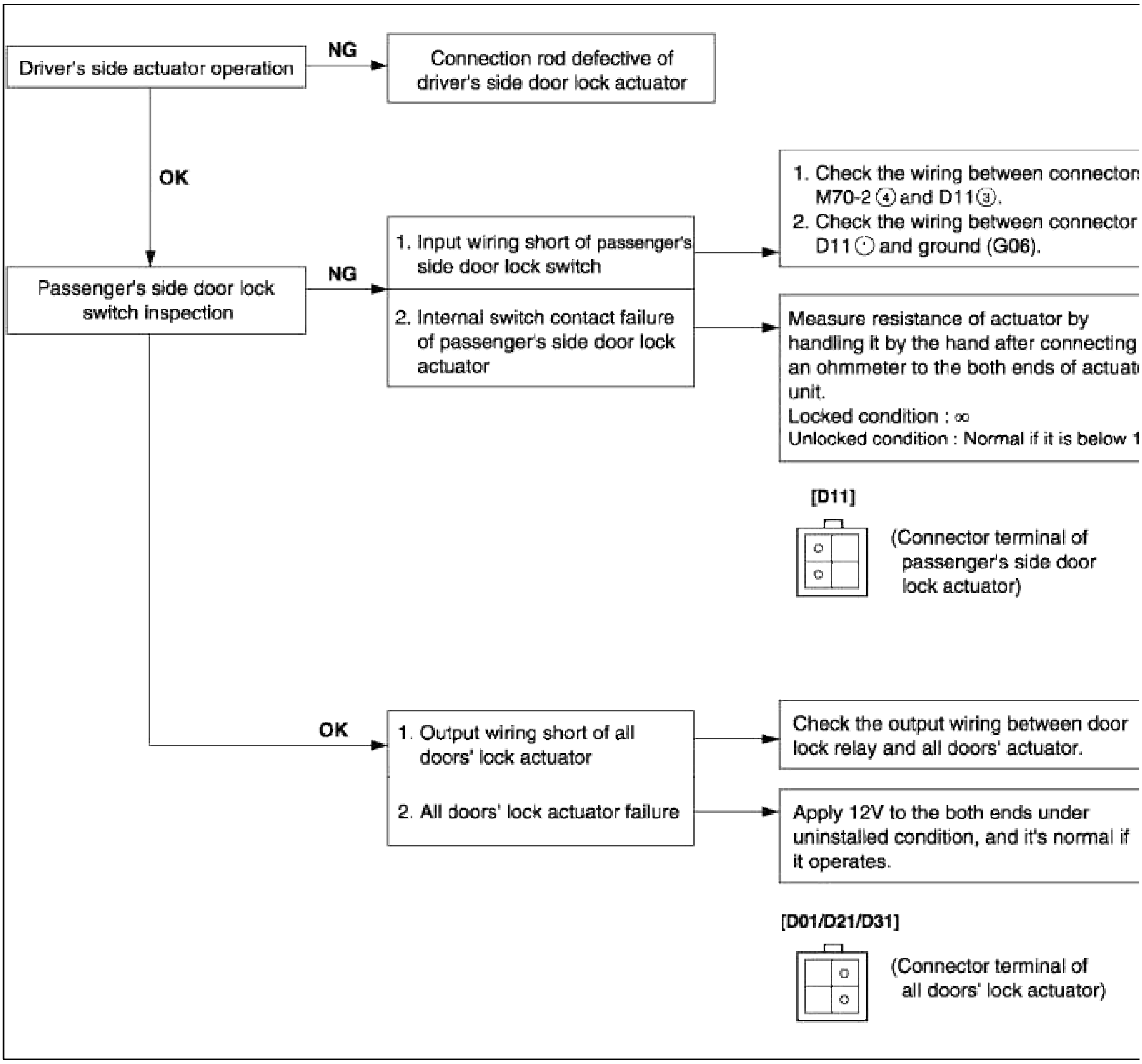
Check the output wiring between door lock relay and all doors' actuator

Apply 12V to the both ends under uninstalled condition, and it's normal if it operates.

[D11/D21/D31]

(Connector terminal of all doors' lock actuator)

4. When passenger side knob is controlled. All doors interlock. But when the driver side knob is controlled, all doors do not interlock.


Driver's side actuator operation
NG
Connection rod defective of driver's side door lock actuator
OK
Passenger's side door lock switch inspection
NG
OK
[D11]
(Connector terminal of passenger's side door lock actuator)
[D01/D21/D31]
(Connector terminal of all doors' lock actuator)

1. Input wiring short of passenger's side door lock switch
2. Internal switch contact failure of passenger's side door lock actuator

1. Check the wiring between connector M70-2 ④ and D11③.
2. Check the wiring between connector D11 ⊙ and ground (G06).

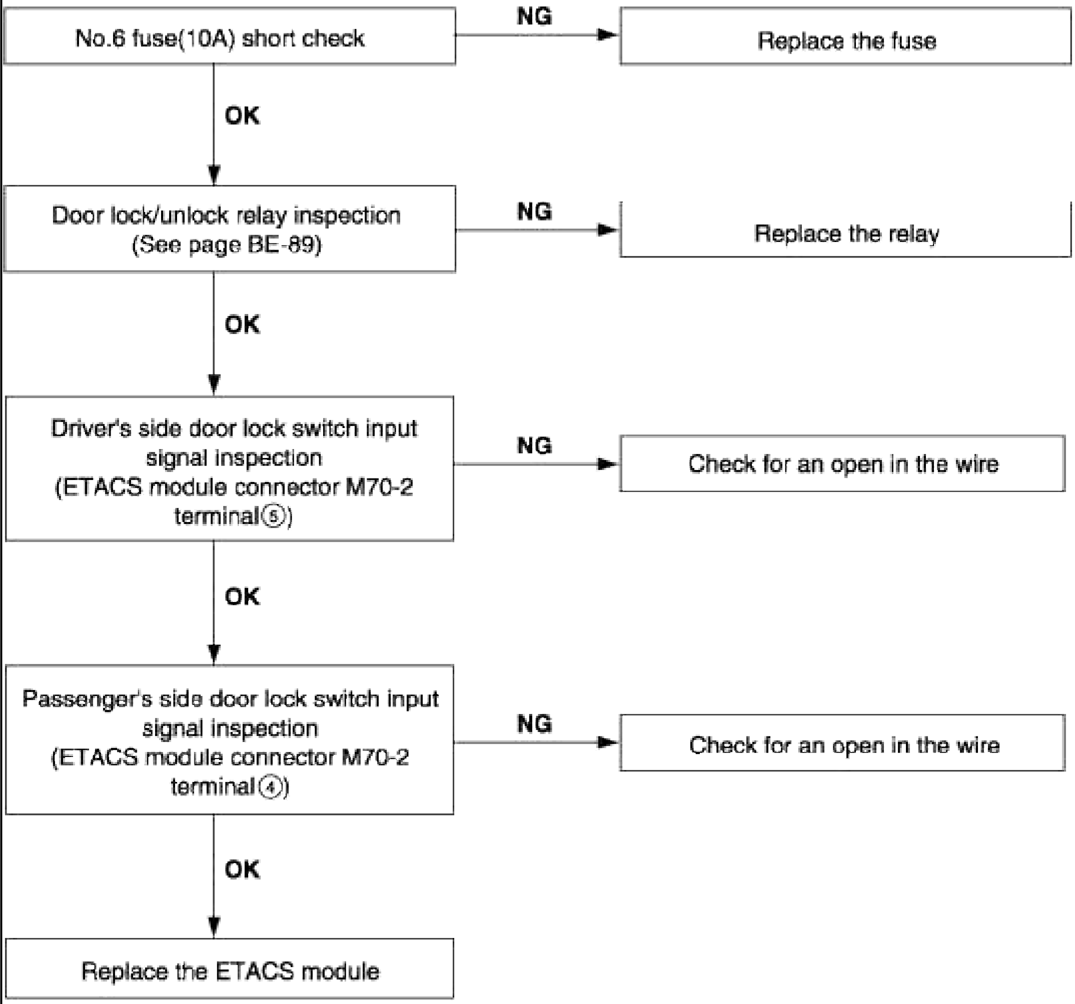
Measure resistance of actuator by handling it by the hand after connecting an ohmmeter to the both ends of actuat unit.
Locked condition : ∞
Unlocked condition : Normal if it is below 1

1. Output wiring short of all doors' lock actuator
2. All doors' lock actuator failure

Check the output wiring between door lock relay and all doors' actuator.

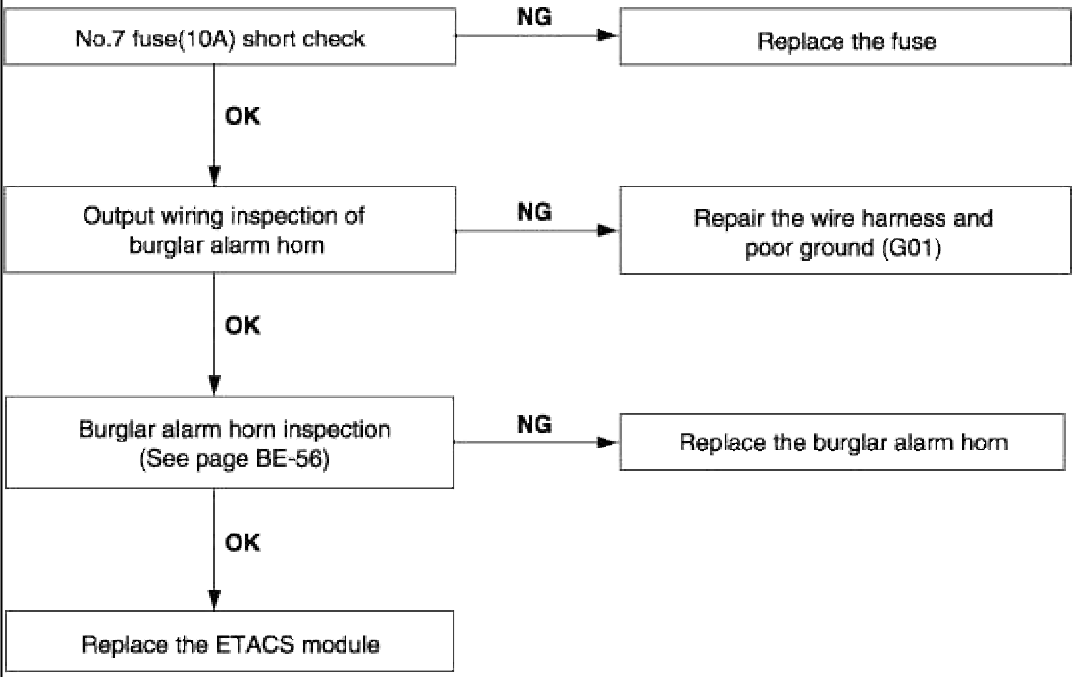
Apply 12V to the both ends under uninstalled condition, and it's normal if it operates.

5. Both sides do not interlock either.

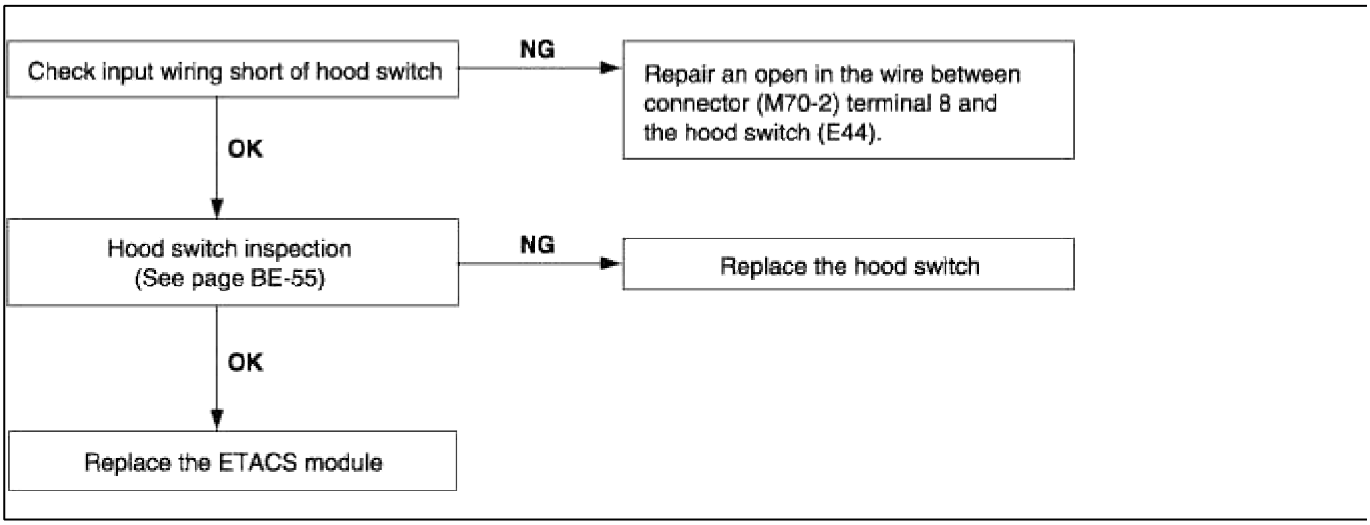

No.6 fuse(10A) short check
NG
Replace the fuse
OK
Door lock/unlock relay inspection (See page BE-89)
NG
Replace the relay
OK
Driver's side door lock switch input signal inspection (ETACS module connector M70-2 terminal⑤)
NG
Check for an open in the wire
OK
Passenger's side door lock switch input signal inspection (ETACS module connector M70-2 terminal④)
NG
Check for an open in the wire
OK
Replace the ETACS module

KEYLESS ENTRY & BURGLAR ALARM SYSTEM

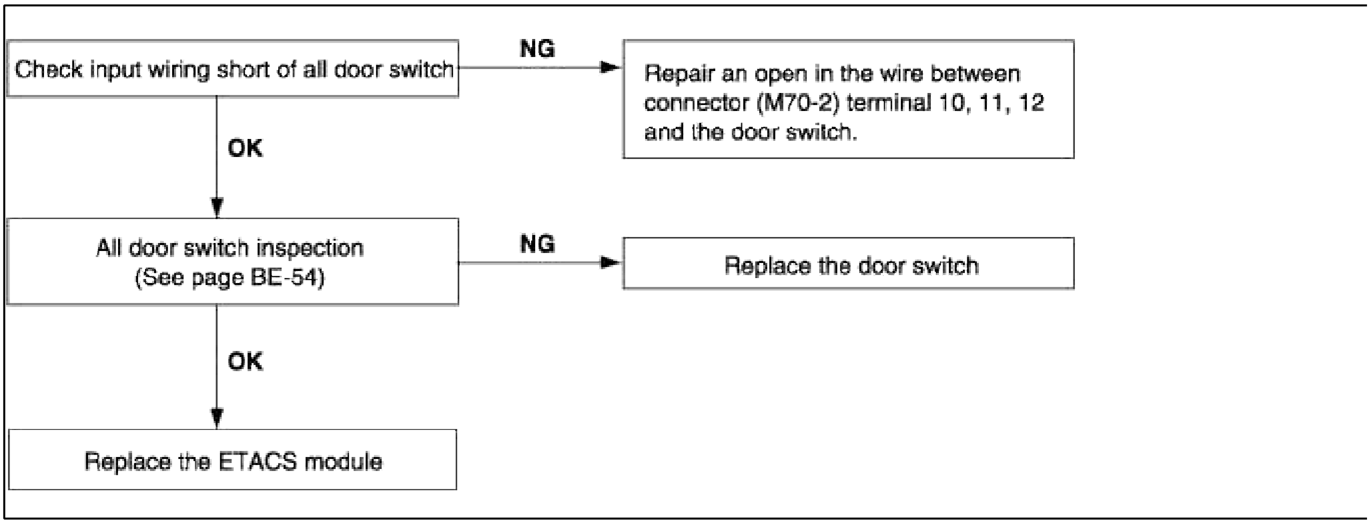
1. Alarm does not work. (Hazard lamp works)


No.7 fuse(10A) short check
NG
Replace the fuse
OK
Output wiring inspection of burglar alarm horn
NG
Repair the wire harness and poor ground (G01)
OK
Burglar alarm horn inspection (See page BE-56)
NG
Replace the burglar alarm horn
OK
Replace the ETACS module

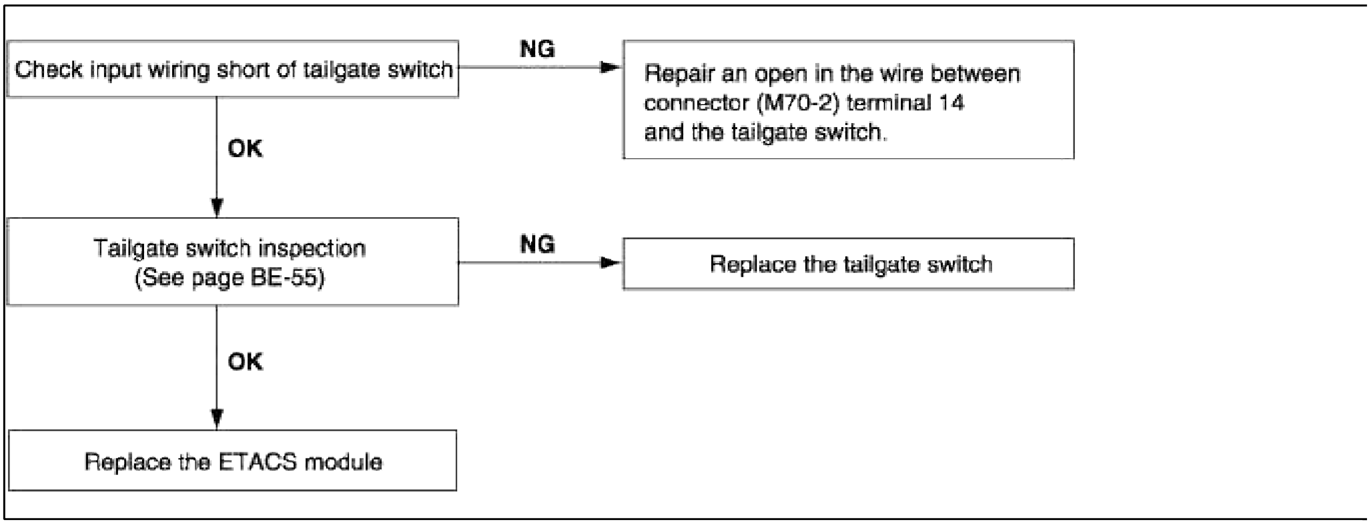
2. When hood is opened inside the car like alarm test, horn does not work.


Check input wiring short of hood switch
NG
Repair an open in the wire between connector (M70-2) terminal 8 and the hood switch (E44).
OK
Hood switch inspection (See page BE-55)
NG
Replace the hood switch
OK
Replace the ETACS module

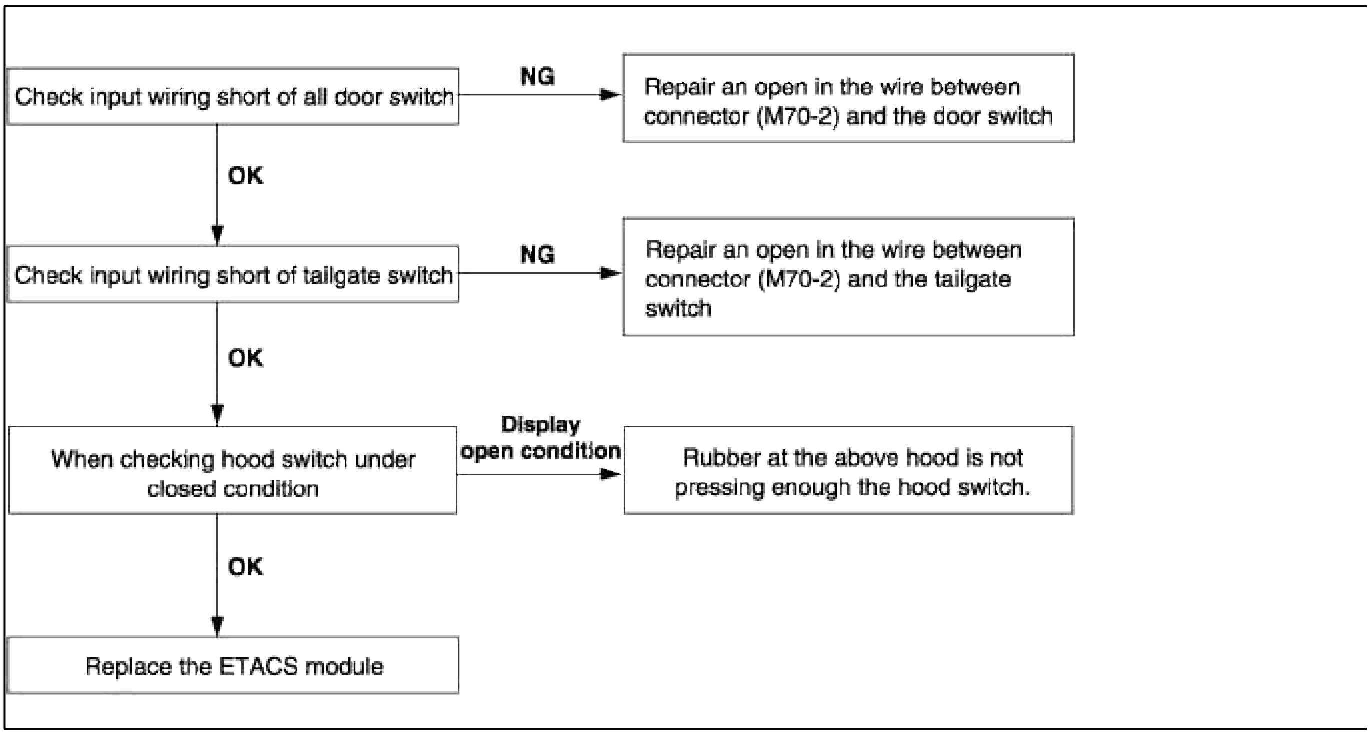
3. When door is opened inside the car like alarm test, horn does not work (If tailgate and hood is opened, alarm works)


Check input wiring short of all door switch
NG
Repair an open in the wire between connector (M70-2) terminal 10, 11, 12 and the door switch.
OK
All door switch inspection (See page BE-54)
NG
Replace the door switch
OK
Replace the ETACS module

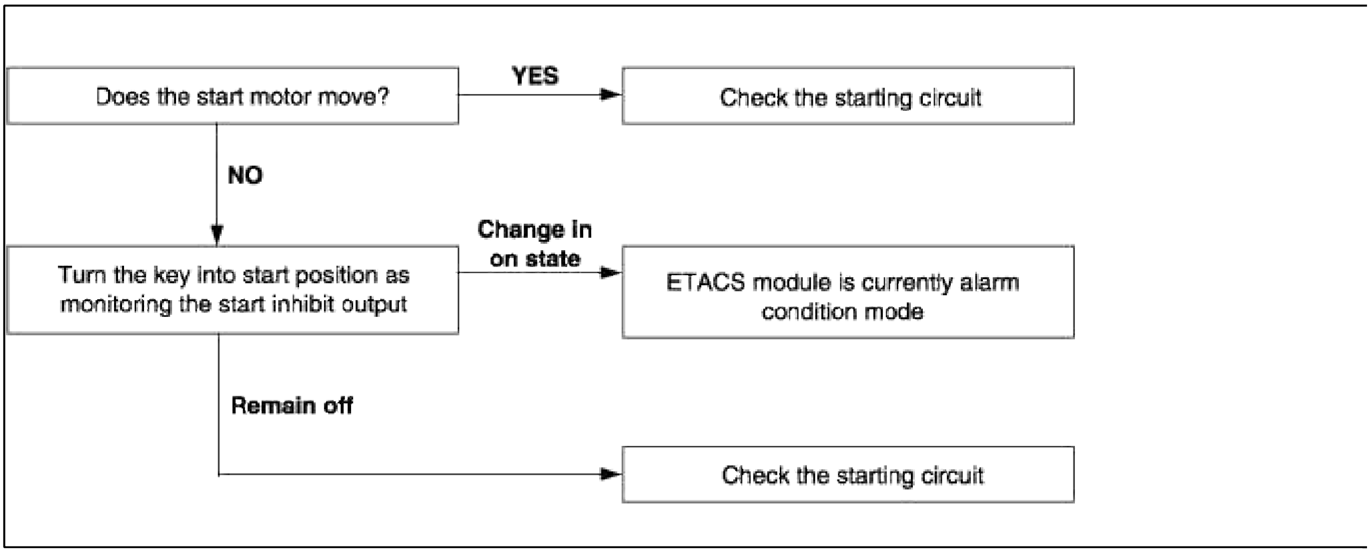
4. When tailgate is opened inside the car like alarm test, horn does not work.


Check input wiring short of tailgate switch
NG
Repair an open in the wire between connector (M70-2) terminal 14 and the tailgate switch.
OK
Tailgate switch inspection (See page BE-55)
NG
Replace the tailgate switch
OK
Replace the ETACS module

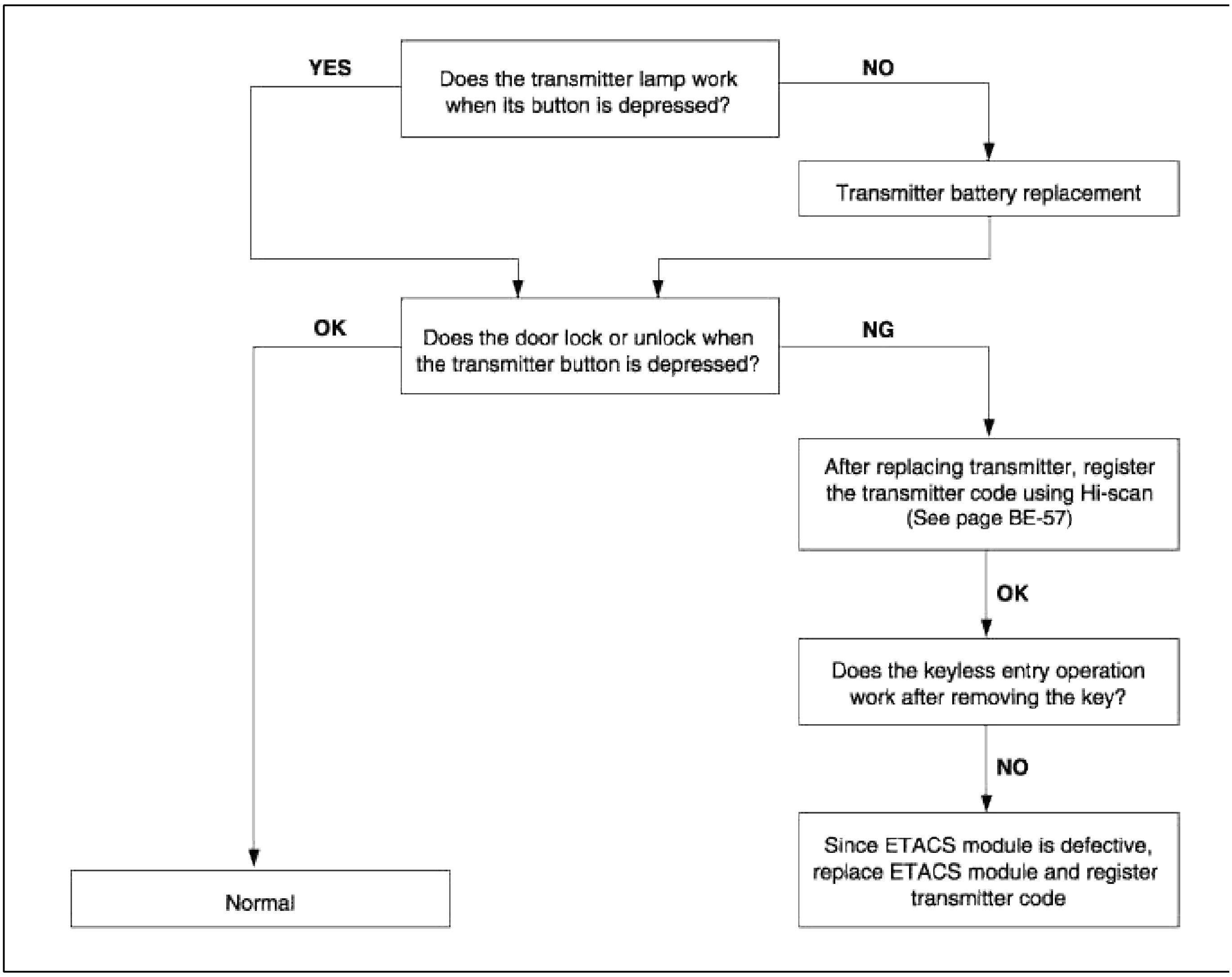
5. When the vehicle is locked by the transmitter, central door lock function works but hazard lamp doesn't blink.


Check input wiring short of all door switch
NG
Repair an open in the wire between connector (M70-2) and the door switch
OK
Check input wiring short of tailgate switch
NG
Repair an open in the wire between connector (M70-2) and the tailgate switch
OK
When checking hood switch under closed condition
Display open condition
Rubber at the above hood is not pressing enough the hood switch.
OK
Replace the ETACS module

6. Engine does not start, when the alarm released condition.


Does the start motor move?
YES
Check the starting circuit
NO
Turn the key into start position as monitoring the start inhibit output
Change in on state
ETACS module is currently alarm condition mode
Remain off
Check the starting circuit

7. Central door lock function works, but keyless entry system does not work.


YES
Does the transmitter lamp work when its button is depressed?
NO
Transmitter battery replacement
OK
Does the door lock or unlock when the transmitter button is depressed?
NG
After replacing transmitter, register the transmitter code using Hi-scan (See page BE-57)
OK
Does the keyless entry operation work after removing the key?
NO
Since ETACS module is defective, replace ETACS module and register transmitter code
Normal

Body Electrical System > General Information > Specifications

SPECIFICATIONS

MULTIFUNCTION SWITCH

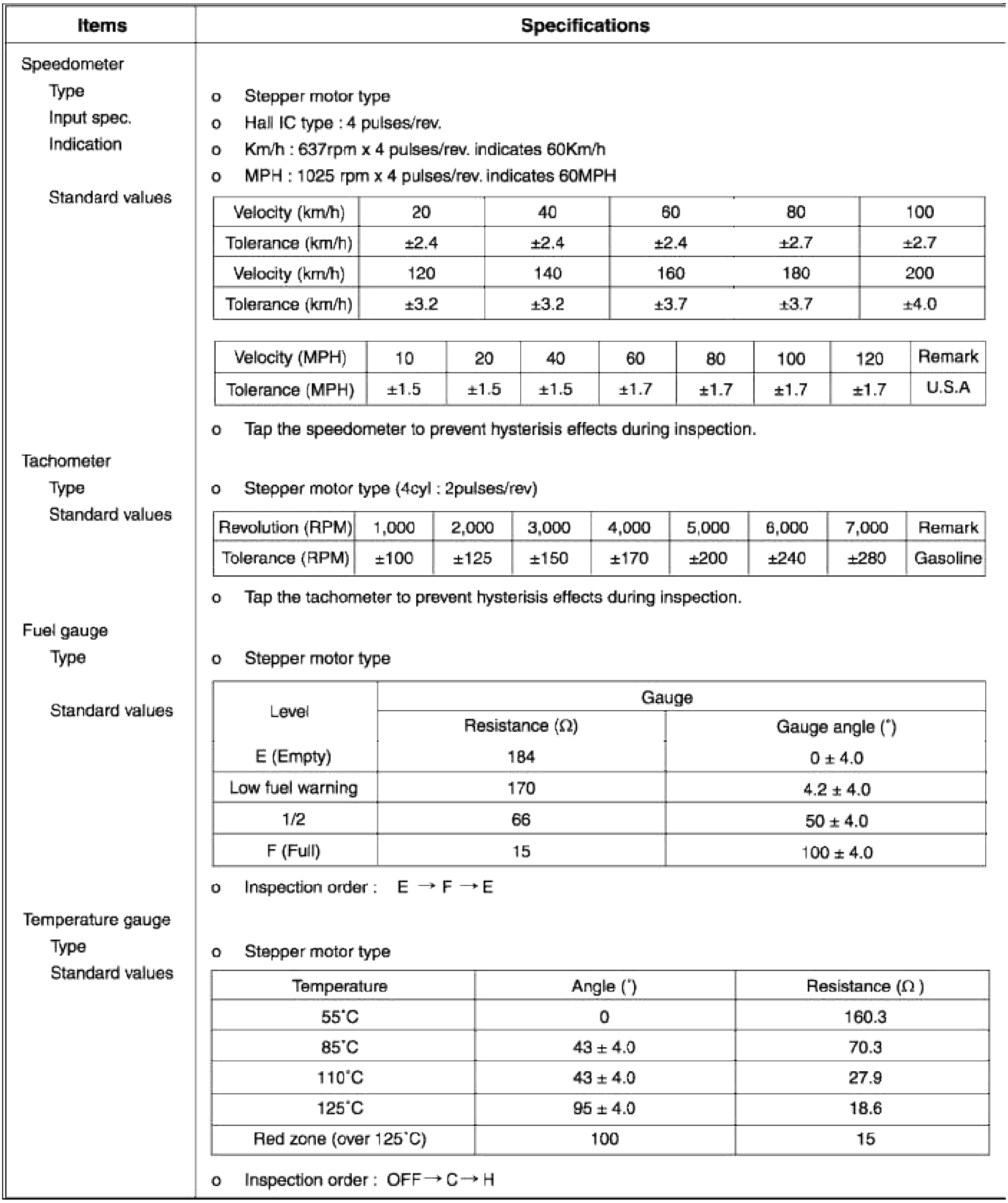
Items	Specifications
Rated voltage	DC 12 V
Operating temperature range	-30°C ~ +80°C (-22 ~ +176°F)
Rated load	
Dimmer & passing switch	High : 15A (Lamp load) Low : 10A (Lamp load) Passing : 15A (Lamp load)
Lighting switch	Lighting : 0.22±0.05A (Relay load)
Turn signal & lane change switch	6.6±0.5A (Lamp load)
Wiper & mist switch	Low, High : 4A (Motor load) Intermittent : 0.22±0.05A (Relay load) Lock : Max. 23A (Motor load)
Washer switch	Mist : 4A (Motor load)
Variable intermittent volume switch	4A (Motor load)
Horn switch	Max. 25mA

	1A (Relay load)

INSTRUMENTS AND WARNING SYSTEM

Warning lamps	Bulb wattage (W)	Color
Illumination	Bulb type : 12V, 1.5W EL type : 47V, 470 Hz	White green
High beam	LED	Blue
Low fuel	LED	Amber
Turn signal (LH, RH)	LED	Green
Battery (charge)	LED	Red
Oil pressure	LED	Red
Air bag	Bulb (1.1W)	Red
Parking brake	LED	Red
Seat belt	LED	Red
Check engine	Bulb (1.1W)	Amber
ABS	Bulb (1.1W)	Amber
Door ajar	LED	Red
Trunk lid open	LED	Amber
OD OFF	LED	Amber

INDICATORS AND GAUGE



Items	Specifications

Speedometer

Type
- o Stepper motor type

Input spec.
- o Hall IC type : 4 pulses/rev.

Indication
- o Km/h : 637rpm x 4 pulses/rev. indicates 60Km/h
- o MPH : 1025 rpm x 4 pulses/rev. indicates 60MPH

Standard values

Velocity (km/h)	20	40	60	80	100
Tolerance (km/h)	±2.4	±2.4	±2.4	±2.7	±2.7
Velocity (km/h)	120	140	160	180	200
Tolerance (km/h)	±3.2	±3.2	±3.7	±3.7	±4.0

Velocity (MPH)	10	20	40	60	80	100	120	Remark
Tolerance (MPH)	±1.5	±1.5	±1.5	±1.7	±1.7	±1.7	±1.7	U.S.A

- o Tap the speedometer to prevent hysterisis effects during inspection.

Tachometer

Type
- o Stepper motor type (4cyl : 2pulses/rev)

Standard values

Revolution (RPM)	1,000	2,000	3,000	4,000	5,000	6,000	7,000	Remark
Tolerance (RPM)	±100	±125	±150	±170	±200	±240	±280	Gasoline

- o Tap the tachometer to prevent hysterisis effects during inspection.

Fuel gauge

Type
- o Stepper motor type

Standard values

Level	Gauge	
	Resistance (Ω)	Gauge angle (°)
E (Empty)	184	0 ± 4.0
Low fuel warning	170	4.2 ± 4.0
1/2	66	50 ± 4.0
F (Full)	15	100 ± 4.0

- o Inspection order : E → F → E

Temperature gauge

Type
- o Stepper motor type

Standard values

Temperature	Angle (°)	Resistance (Ω)
55°C	0	160.3
85°C	43 ± 4.0	70.3
110°C	43 ± 4.0	27.9
125°C	95 ± 4.0	18.6
Red zone (over 125°C)	100	15

- o Inspection order : OFF → C → H

LIGHTING SYSTEM

Items	Bulb wattage (W)
Head lamp	60W /55W (High / Low beam)
Front turn signal lamp	27W
Front position lamp	5W
Front fog lamp	27W
Side marker lamp	5W
Rear combination lamps	
Tail/stop lamp	8W / 28W
Back up lamp	17W
Turn signal lamp	27W
Luggage lamp	5W
Room lamp	10W
Center high mounted stop lamp	17W
Map lamp	10W x 2
License plate lamp	5W

AUDIO

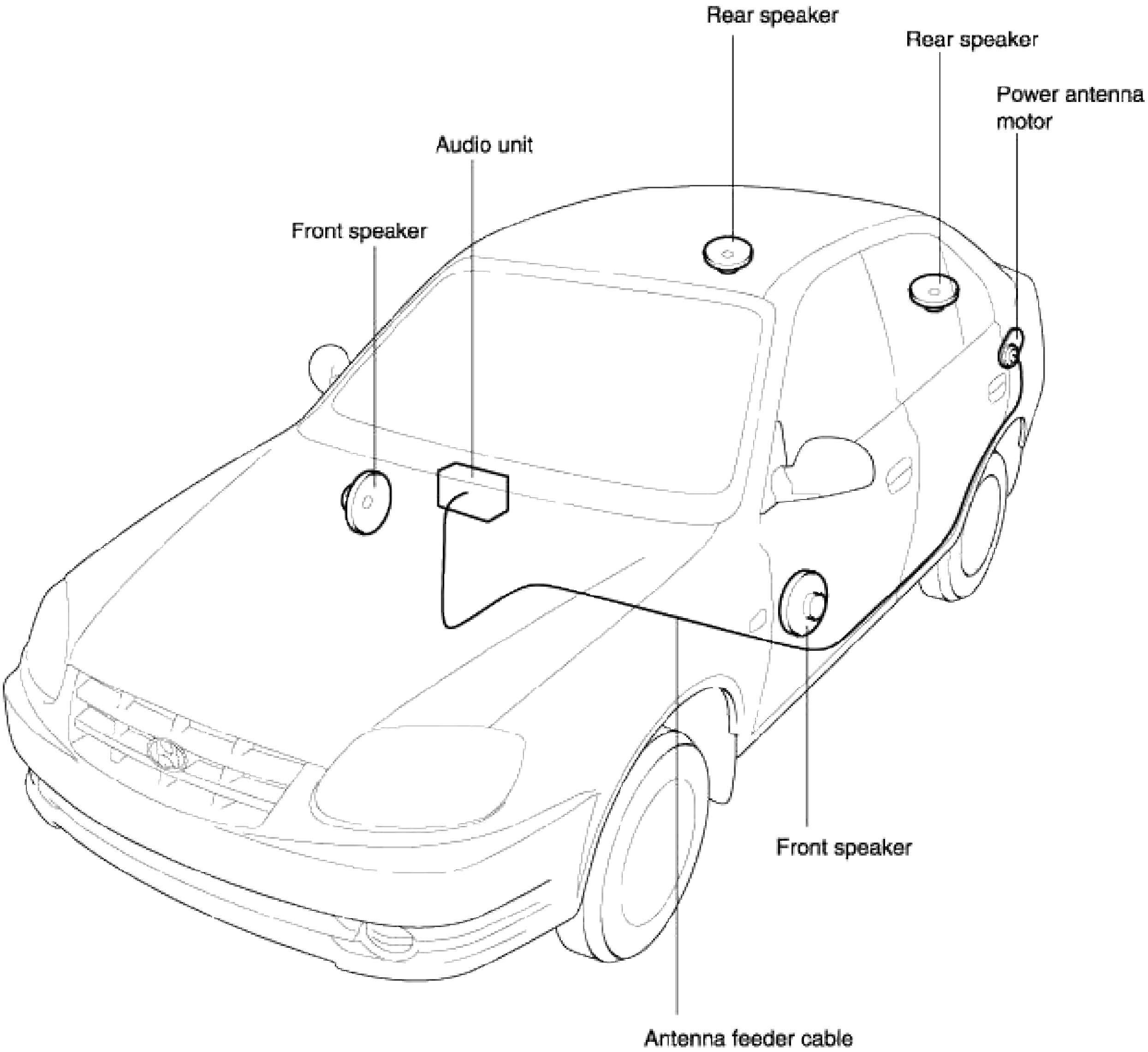
Items	H210	H240, H260
Rated output	Max. 20W x 2	Max. 20W x 4
Load impedance	4Ω x 4	4Ω x 4
Band	AM/FM	AM/FM
Tuning type	PLL Synthesized type	PLL Synthesized type
Dark current	Max. 2mA	Max. 2mA
Frequency range / Channel	AM : 530 ~ 1710KHZ/10 KHZ	AM : 530 ~ 1710KHZ/10 KHZ
	FM : 87.9 ~ 107.9MHZ/200 KHZ	FM : 87.9 ~ 107.9 MHZ/200KHZ

WINDSHIELD WIPER AND WASHER

Items	Specifications
Wiper motor	
Speed/current at 10kg·cm load test (1.0 Nm, 0.7 lb·ft)	Low : 44~52 rpm/3.5A or less High : 64~78 rpm/4.5A or less
Speed/current at 40kg·cm load test (3.9 Nm, 2.9 lb·ft)	Low : 39~47 rpm/5.5A or less High : 56~68 rpm/7.0A or less
Current when locking	Low : 24A or less High : 28A or less
Windshield washer	
Motor type	DC ferrite magnet
Pump type	Centrifugal type
Current	3.8A
Discharge pressure	1.2 kg/cm^2 or more
Flow rate	1,320 cc/min. or more
Overload capacity (Continuous operation)	
With water	60 sec. or less
Without water	20 sec. or less

Body Electrical System > Audio > Components and Components Location

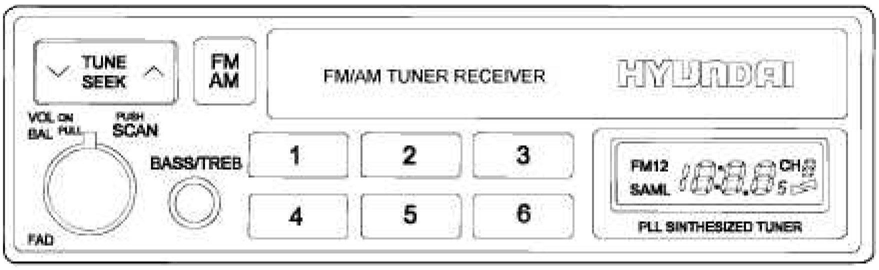
COMPONENTS


Rear speaker
Rear speaker
Power antenna motor
Audio unit
Front speaker
Front speaker
Antenna feeder cable

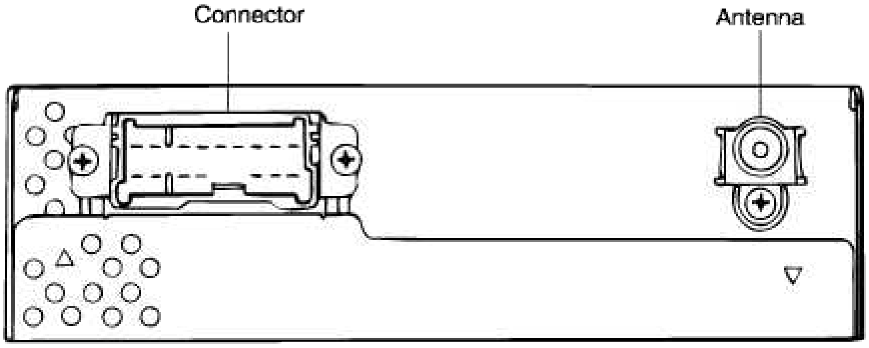
Body Electrical System > Audio > Audio Unit > Components and Components Location

COMPONENTS

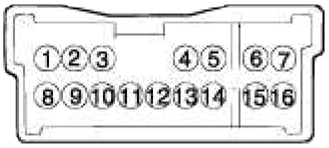
[H210]


TUNE
SEEK
FM
AM
FM/AM TUNER RECEIVER
HYUNDAI
VOL ON
BAL PULL
PUSH
SCAN
BASS/TREB
1
2
3
4
5
6
FM12
SAML
CH
PLL SINTHESIZED TUNER
FAD

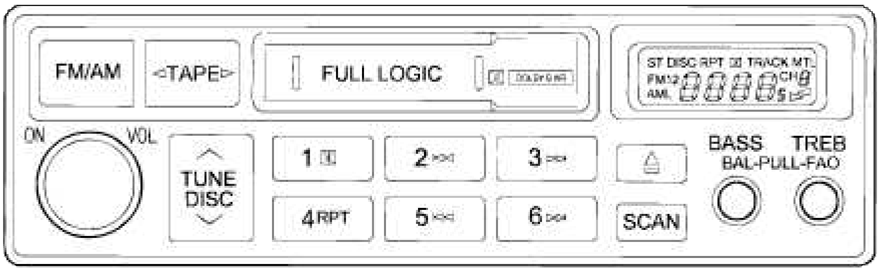
ETJA001W


Connector
Antenna

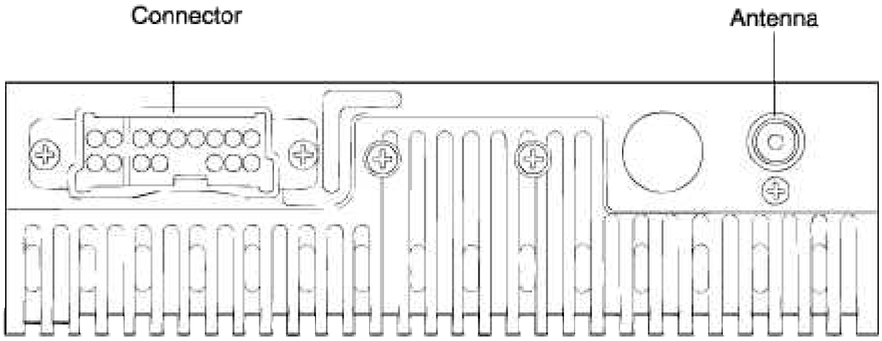
ETJA001X

Connector	Terminal	Description
 ETJA001C	1	Antenna
	2	Rear left speaker(-)
	3	Front left speaker(-)
	4	Front right speaker(-)
	5	Rear right speaker(-)
	6	Illumination(-)
	7	ACC(+)
	8	Ground
	9	Rear left speaker(+)
	10	Front left speaker(+)
	11	N.C.
	12	N.C.
	13	Front right speaker(+)
	14	Rear right speaker(+)
	15	Illumination(+)
	16	Battery(+)

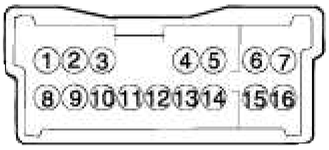
[H240]


FM/AM
◁TAPE▷
FULL LOGIC
ST DISC RPT TRACK MT
FM1/2
AM
CH
ON
VOL
TUNE
DISC
1
2
3
4RPT
5
6
SCAN
BASS
TREB
BAL-PULL-FAO

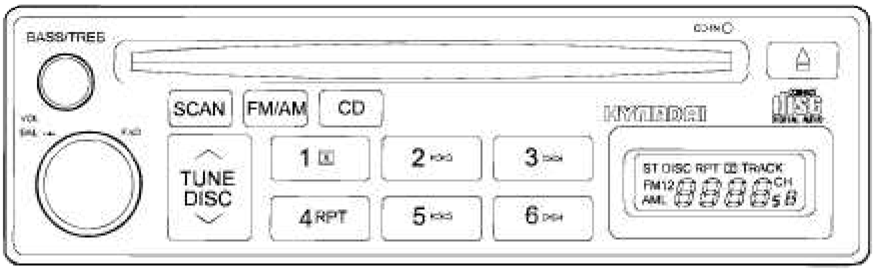
ETJA001B


Connector
Antenna

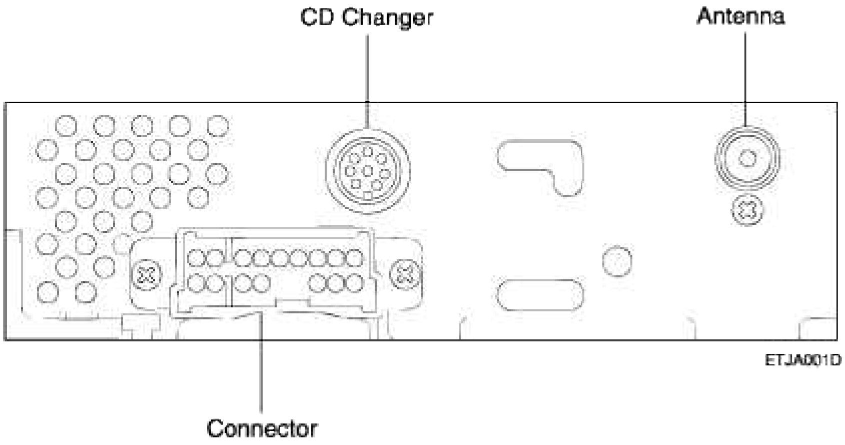
ETJA001A

Connector	Terminal	Description
 ETJA001C	1	Antenna
	2	Rear left speaker(-)
	3	Front left speaker(-)
	4	Front right speaker(-)
	5	Rear right speaker(-)
	6	Illumination(-)
	7	ACC(+)
	8	Ground
	9	Rear left speaker(+)
	10	Front left speaker(+)
	11	N.C.
	12	N.C.
	13	Front right speaker(+)
	14	Rear right speaker(-)
	15	Illumination(+)
	16	Battery(+)

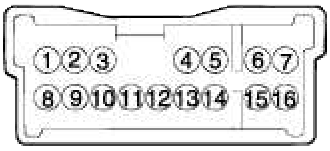
[H260]

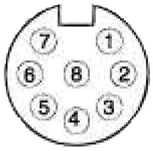

BASS/TREB
VOL
CD IN
SCAN
FM/AM
CD
TUNE
DISC
1
2
3
4 RPT
5
6
HYUNDAI
ST DISC RPT TRACK
FM12
AML
CH

ETJA001E


CD Changer
Antenna
Connector

ETJA001D

Connector	Terminal	Description
 ETJA001C	1	N.C.
	2	Rear left speaker(-)
	3	Front left speaker(-)
	4	Front right speaker(-)
	5	Rear right speaker(-)
	6	Illumination(-)
	7	ACC(+)
	8	Ground
	9	Rear left speaker(+)
	10	Front left speaker(+)
	11	N.C.
	12	N.C.
	13	Front right speaker(+)
	14	Rear right speaker(+)
	15	Illumination(+)
	16	Battery(+)

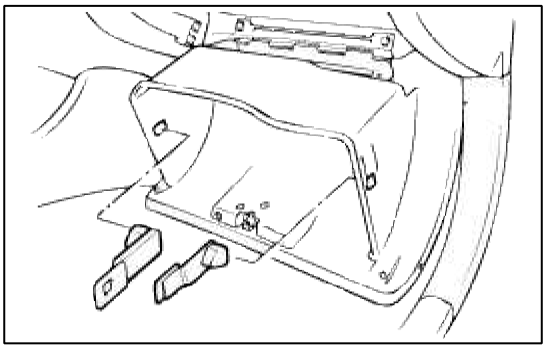
Connector	Terminal	Description
(CD Changer)  ETJA001G	1	R
	2	CD ON
	3	BUS
	4	B+
	5	M. Ground
	6	N.C.
	7	L
	8	A.Ground

Body Electrical System > Audio > Audio Unit > Repair procedures

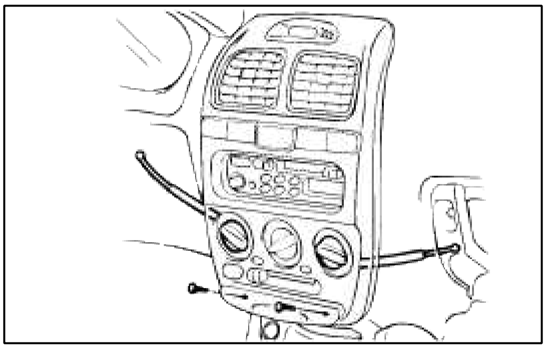
REMOVAL AND INSTALLATION

1. Disconnect the negative battery terminal.
2. Remove the glove box.

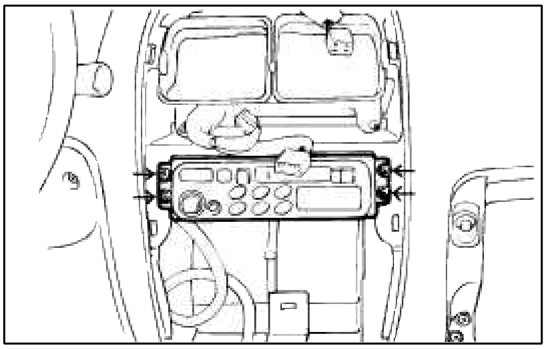
3. Disconnect the heater control cables under the glove box and lower crashpad.



4. Loosen the screws and remove the center facia panel.



5. Remove the audio mounting screws (4EA) and the audio system.

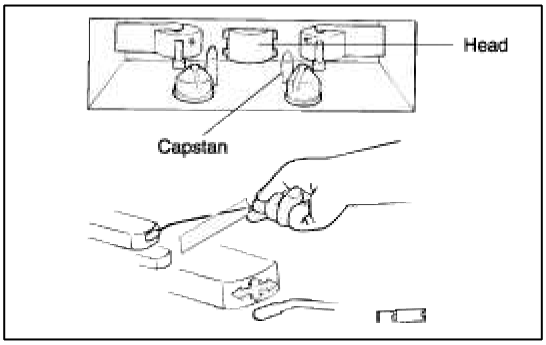


6. Installation is the reverse of removal.

INSPECTION

TAPE HEAD AND CAPSTAN CLEANING

1. To obtain optimum performance, clean the head, and capstan as often as necessary, depending on frequency of use and tape cleanness.
2. To clean the tape head and capstan, use a cotton swab dipped in ordinary rubbing alcohol. Wipe the head and capstan.

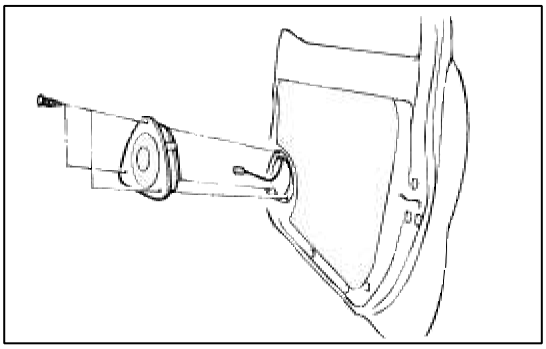


Body Electrical System > Audio > Speakers > Repair procedures

REMOVAL AND INSTALLATION

FRONT SPEAKER

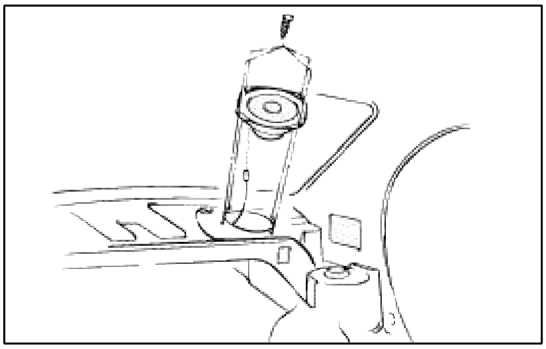
1. Remove the front door trim panel and front speaker. (see BD group - front door)



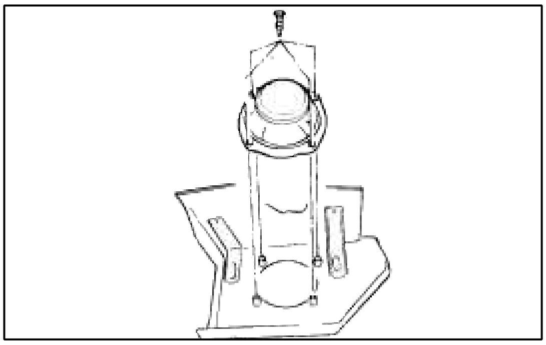
2. Installation is the reverse of removal.

REAR SPEAKER

1. Remove the rear package tray or covering shelf trim. (see BD group - interior trim)

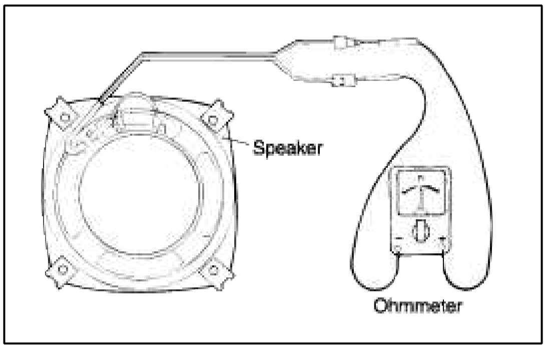


2. Remove the rear speaker.



INSPECTION

1. Check the speaker with an ohmmeter. If an ohmmeter indicates the correct impedance of the speaker when checking between the speaker (+) and speaker (-) of the same channel, the speaker is ok.
2. If a clicking sound is emitted from the speaker when the ohmmeter is connected to the speaker terminals, the speaker is ok.

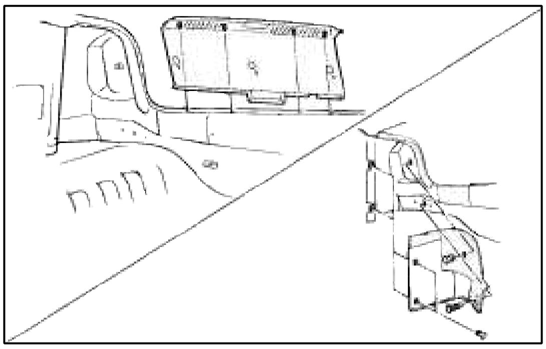


Body Electrical System > Audio > Antenna > Repair procedures

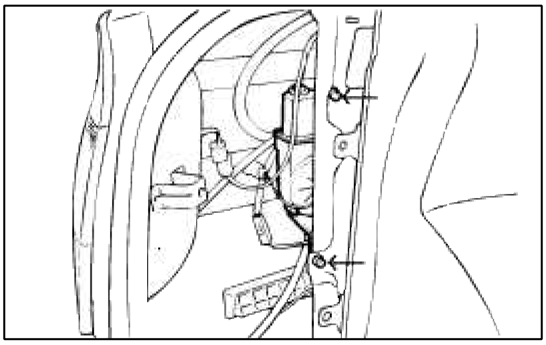
REMOVAL AND INSTALLATION

1. Disconnect the negative battery terminal.

2. Remove the rear transverse trim and left side luggage rear trim.



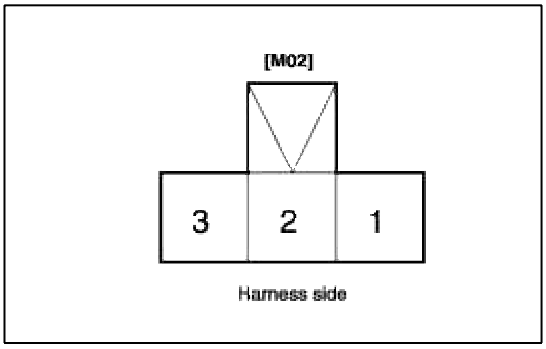
3. Remove the antenna mounting nut and bolt.
   Disconnect the wiring connector and the antenna feeder cable.



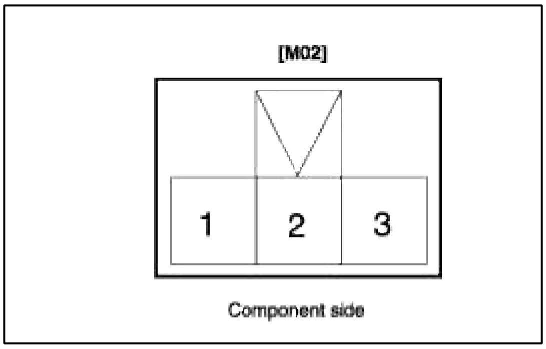
4. Installation is the reverse of removal.

INSPECTION

1. Disconnect the connector from the antenna assembly.
2. Check if the battery voltage is measured between terminal 1 and 3 of harnessside at all time.
3. Check if the battery voltage is measured between terminal 1 and 2 of the harnessside when the ignition switch and audio switch are turned on.

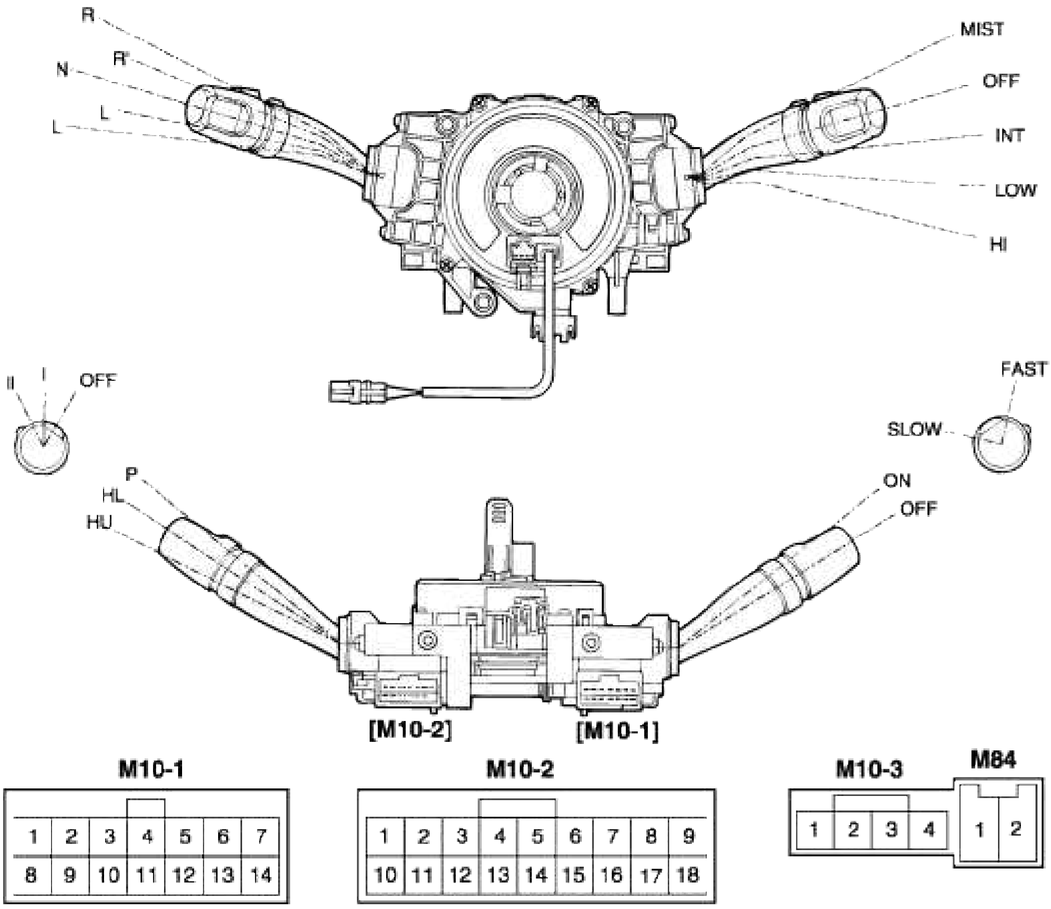


4. After connecting battery source to terminal 2 and 3 of the component side,check if the motor operates properly (Antenna moves up.)
5. Check if the motor operates (antenna moves down) when terminal 2 is disconnectedfrom battery source.



Body Electrical System > Multifunction switch > Components and Components Location

COMPONENTS


R
R'
N
L
L
MIST
OFF
INT
LOW
HI
II
I
OFF
FAST
SLOW
P
HL
HU
ON
OFF
[M10-2]
[M10-1]
M10-1
1 2 3 4 5 6 7
8 9 10 11 12 13 14
M10-2
1 2 3 4 5 6 7 8 9
10 11 12 13 14 15 16 17 18
M10-3
1 2 3 4
M84
1 2

Circuit connection

Connector No.	Terminal No.	Description	Connector No.	Terminal No.	Description
M10-2	1	Head lamp passing	M10-1	1	Wiper high speed
	2	Head lamp high beam power		2	Wiper low speed
	3	-		3	Wiper parking
	4	-		4	Mist switch
	5	-		5	Wiper & washer ground
	6	-		6	Intermittent wiper
	7	Turn signal RH lamp		7	Front washer switch
	8	Flasher unit power		8	-
	9	Turn signal LH lamp		9	-
	10	Head lamp low beam power		10	-
	11	Dimmer & passing ground		11	-
	12	-		12	-
	13	-		13	Intermittent wiper volume
	14	Tail lamp switch		14	Intermittent wiper ground
	15	Head lamp switch	M84	1	Driver initiator low
	16	-		2	Driver initiator high
	17	Lighting switch ground	M10-3	1	Horn (B+)
	18	-		2	-
				3	-
				4	-

Body Electrical System > Multifunction switch > Multi Function Switch > Repair procedures

REMOVAL AND INSTALLATION

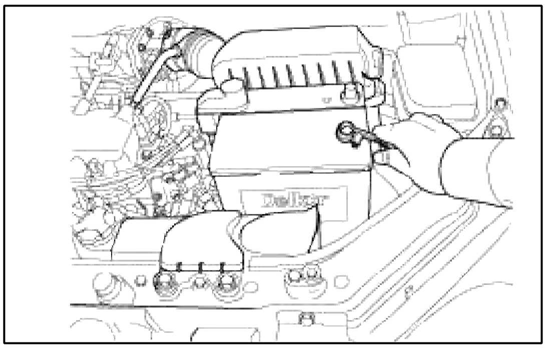
CAUTION

- Never attempt to disassemble or repair the air bag module or clock spring. If faulty, replace it.
- Do not drop the air bag module or clock spring or allow contact with water, grease or oil. Replace if a dent, crack, deformation or rust are detected.
- The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.
- Do not expose the air bag module to temperatures over 93°C (200°F).
- After deployment of an air bag, replace the clock spring with a new one.
- Wear gloves and safety glasses when handling an air bag that has already been deployed.
- An undeployed air bag module should only be disposed of in accordance with the procedures mentioned in the Restraints section.
- When you disconnect the air bag module-clock spring connector, take care not to apply excesive force to it.
- The removed air bag module should be stored in a clean, dry place.
- Prior to installing the clock spring, align the mating mark and "NEUTRAL" position indicator of the clock spring, and, after turning the front wheels to the straight-ahead position, install the clock spring to the column switch. If the mating mark of the clock spring is not properly aligned, the steering wheel may not completely rotate during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver. To inspect the clock spring, refer to the Restraints section.

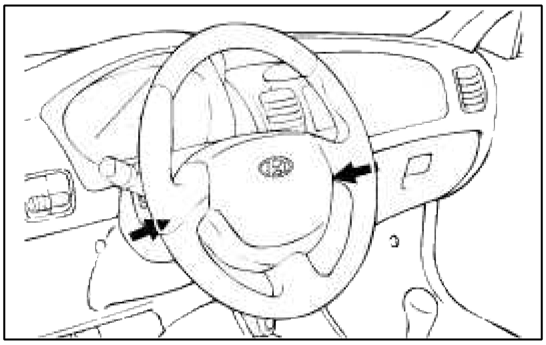
1. Disconnect the negative battery terminal.

NOTE

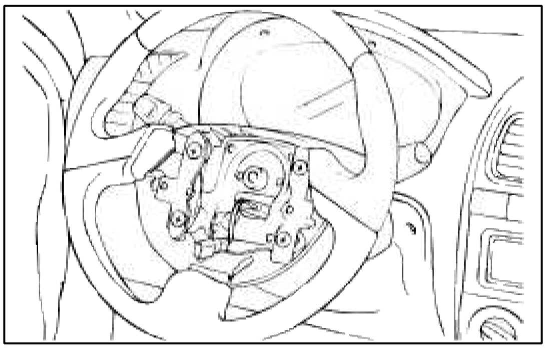
Prior to doing any further work after disconnection of the battery cable, wait at least 30 seconds.



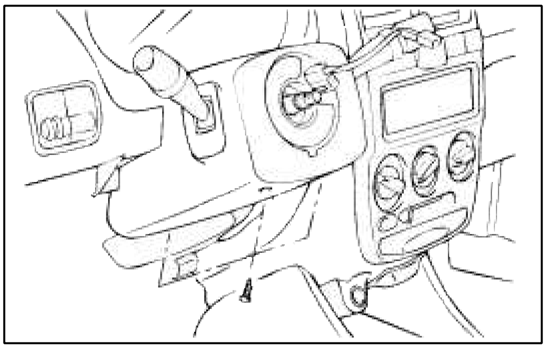
2. Remove the air bag module mounting bolts (2EA) with an asterix wrench. (Tor-x socket)
Disconnect the horn connector and the air bag module connector, and remove the air bag module.



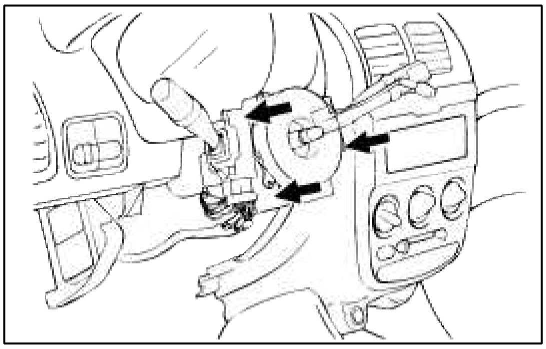
3. Remove the steering wheel after removing a nut.



4. Remove the steering column upper and lower shrouds using a phillips screwdriver.



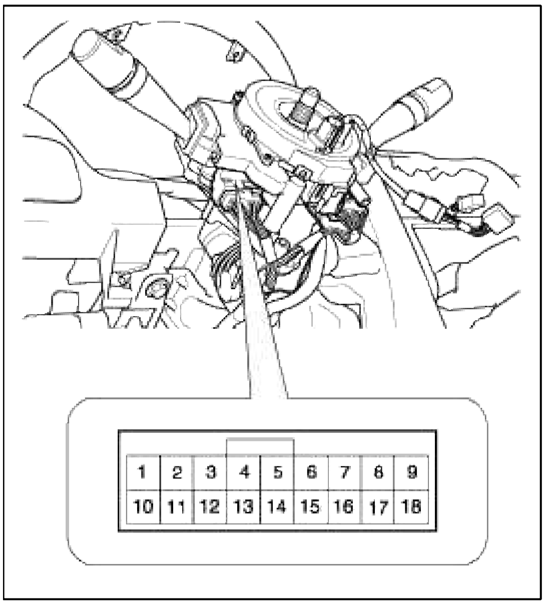
5. Remove the multifunction switch assembly mounting screws (3EA) and multifunction switch assembly after removal of the connectors.



6. Installation is the reverse of removal.

INSPECTION

LIGHTING SWITCH INSPECTION



LIGHTING SWITCH (CONNECTOR NO. : M10-2)

Position \ Terminal	14	15	16	17
OFF				
I	○	—	—	○
II	○	○	○	○

DIMMER AND PASSING SWITCH (CONNECTOR NO. : M10-2)

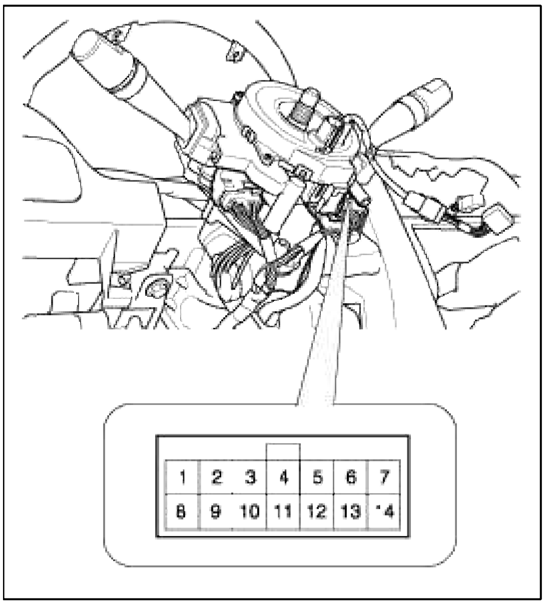
Position \ Terminal	1	2	10	11
HU		○	—	○
HL			○	○
P	○	○	—	○

HU : Head lamp high beam
HL : Head lamp low beam
P : Head lamp passing switch

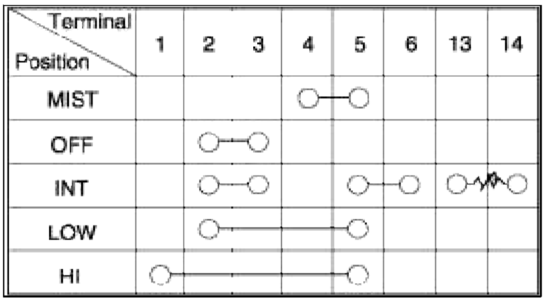
TURN SIGNAL SWITCH (CONNECTOR NO. : M10-2)

Hazard switch	Turn signal switch \ Terminal	7	8	9
OFF	L		○	○
	N			
	R	○	○	

WIPER AND WASHER SWITCH INSPECTION

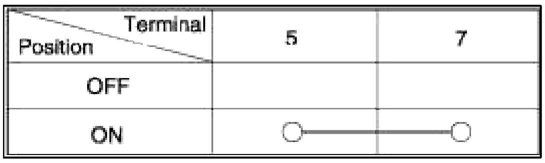


WIPER SWITCH (CONNECTOR NO. : M10-1)



Position \ Terminal	1	2	3	4	5	6	13	14
MIST				○	○			
OFF		○	○					
INT		○	○		○	○	○	○
LOW		○			○			
HI	○				○			

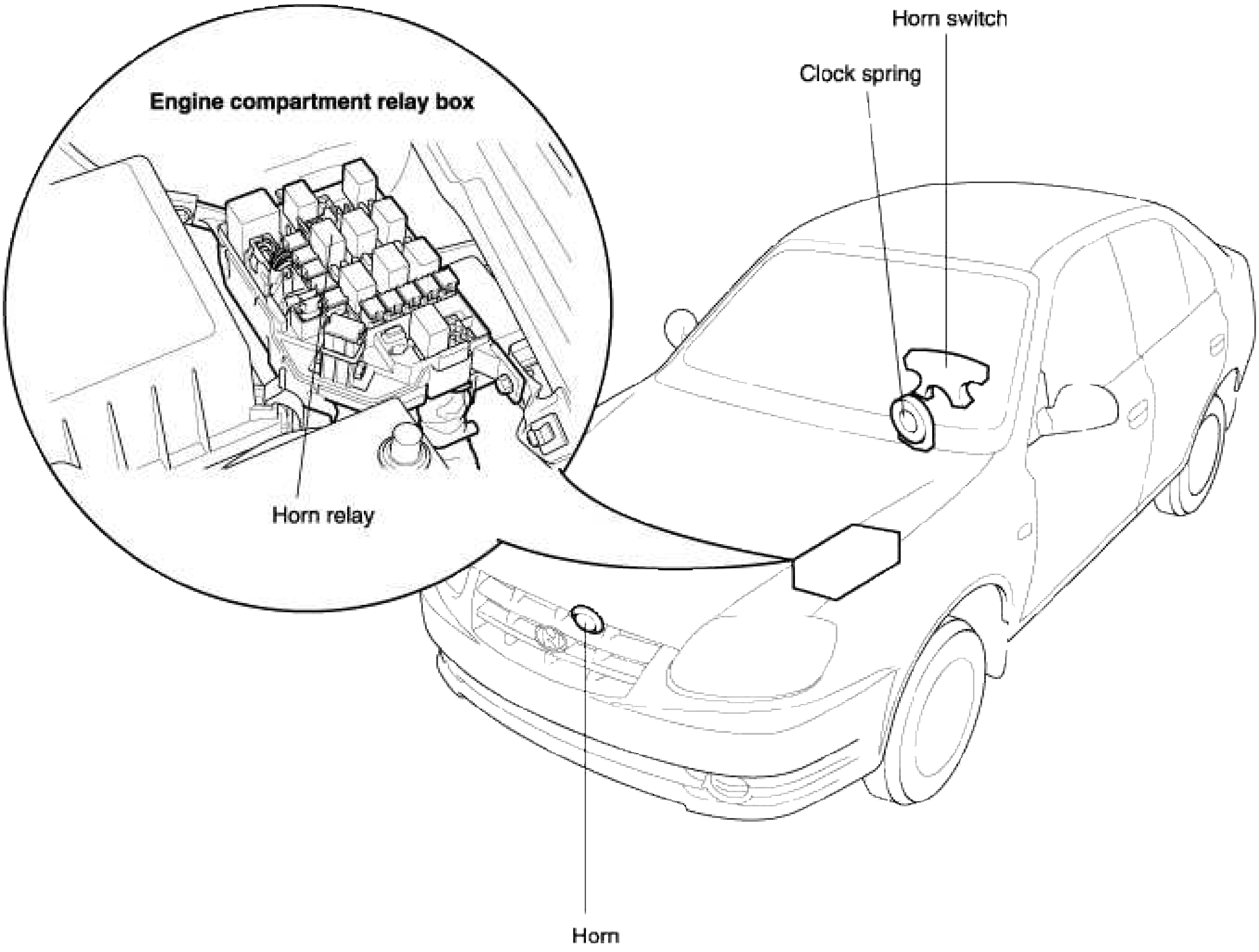
WASHER SWITCH (CONNECTOR NO. : M10-1)



Position \ Terminal	5	7
OFF		
ON	○	○

Body Electrical System > Horn > Components and Components Location

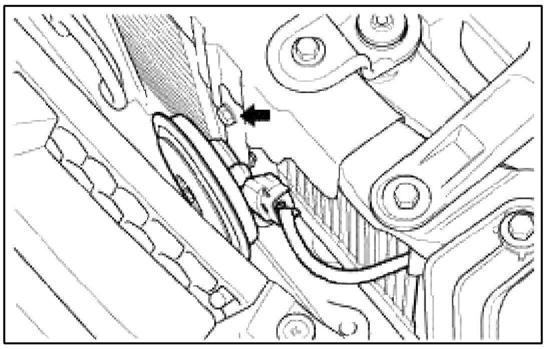
COMPONENTS


Horn switch
Clock spring
Engine compartment relay box
Horn relay
Horn

Body Electrical System > Horn > Horn > Repair procedures

REMOVAL AND INSTALLATION

1. Remove the bolt and disconnect the horn connector, then remove the horn.



2. Installation is the reverse of removal.

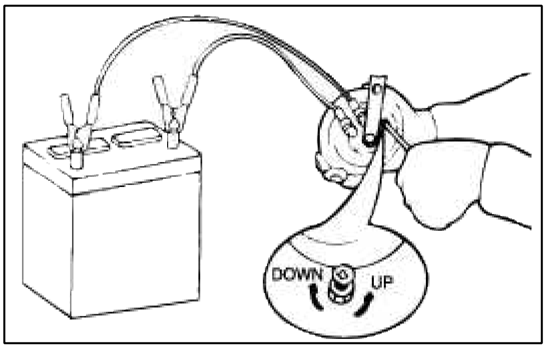
INSPECTION

1. Test the horn by connecting battery voltage to the 1 terminal and ground the 2 terminal.
2. The horn should make a sound. If the horn fails to make a sound, replace it.

ADJUSTMENT

NOTE

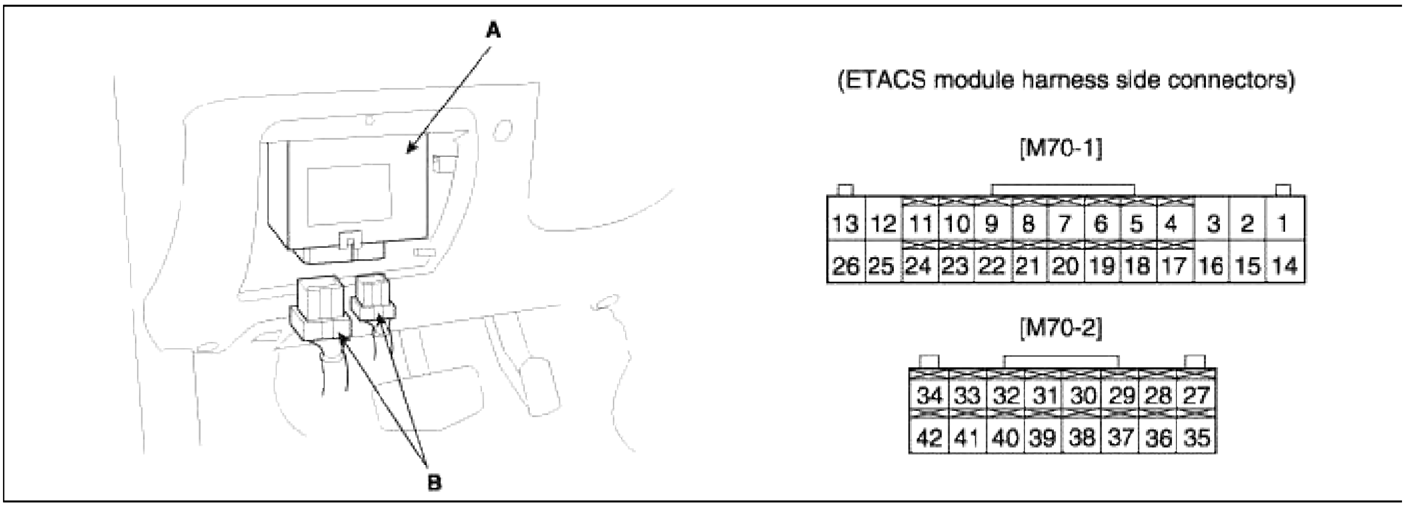
After adjustment, apply a small amount of paint around the screw head to keep it from loosening.



Body Electrical System > Keyless Entry And > Schematic Diagrams

ETACS MODULE INPUT SIGNAL TEST

1. Disconnect the wire connectors(B) from the ETACS module(A).
2. Inspect the connectors(B) on wire harness side as shown in the below.


A
B
(ETACS module harness side connectors)
[M70-1]
13 12 11 10 9 8 7 6 5 4 3 2 1
26 25 24 23 22 21 20 19 18 17 16 15 14
[M70-2]
34 33 32 31 30 29 28 27
42 41 40 39 38 37 36 35

Terminals No.	Test condition	Standard value
38-35 (GND)	Door switch "ON" (Door opened)	Below 1Ω
	Door switch "OFF" (Door closed)	1MΩ or higher
40-35 (GND)	Luggage compartment door switch "ON" (Luggage compartment door opened)	Below 1Ω
	Luggage compartment door switch "OFF" (Luggage compartment door closed)	1MΩ or higher
34-35 (GND)	Engine hood switch "ON" (Engine hood opened)	Below 1Ω
	Engine hood switch "OFF" (Engine hood closed)	1MΩ or higher
37-35 (GND)	Driver's door switch "ON" (Driver's door opened)	Below 1Ω
	Driver's door switch "OFF" (Driver's door closed)	1MΩ or higher
36-35 (GND)	Assist door switch "ON" (Assist door opened)	Below 1Ω
	Assist door switch "OFF" (Assist door closed)	1MΩ or higher
39-35 (GND)	Door warning switch "ON" (Key inserted)	Battery voltage
	Door warning switch "OFF" (Key removed)	Below 1V
42-35 (GND)	Trunk key unlock switch "ON" (Trunk lid is unlocked with key)	Below 1Ω
	Trunk key unlock switch "OFF"	1MΩ or higher
27-35 (GND)	Always	Battery voltage
17-35 (GND)	Ignition switch is turned to "ON" position	Battery voltage
31-35 (GND)	Driver's door lock switch "ON" (Driver's door unlock detection)	Below 1Ω
	Driver's door lock switch "OFF" (Driver's door lock detection)	1MΩ or higher
30-35 (GND)	Assist door lock switch "ON" (Assist door unlock detection)	Below 1Ω
	Assist door lock switch "OFF" (Assist door lock detection)	1MΩ or higher
32-35 (GND)	Rear door lock switch "ON" (Rear door unlock detection)	Below 1Ω
	Rear door lock switch "OFF" (Rear door lock detection)	1MΩ or higher
14-35 (GND)	Always	Battery voltage
13-35 (GND)	Engine Start	Battery voltage
35 (GND) - Body ground	Always	Below 1Ω
3-35 (GND)	Burglar alarm horn operation	ON
5-35 (GND)	Driver's door key unlock switch "ON" (Driver's door is unlocked with key)	Below 1Ω
11-35 (GND)	Assist door and tailgate key unlock switch "ON" (Assist door and tailgate are unlocked with key)	Below 1Ω

Body Electrical System > Keyless Entry And > Description and Operation

DESCRIPTION

BURGLAR ALARM SYSTEM

- A door is forced open.
- A door is unlocked without using the transmitter.
- The trunk lid is opened without using the key.
- The hood is opened.
- The engine starter circuit and battery circuit are bypassed by breaking the ignition switch.

KEYLESS ENTRY SYSTEM

ANTI-THEFT FUNCTION

1. **ARM FUNCTION**

Pressing the remote key lock button will result in a 0.5-second pulse issued to lock all doors.

Pressing the remote keypad unlock button once will result in a 0.5-second unlock pulse issued to unlock all doors.

As part of the arming sequence the alarm first enters a pre-armed state before falling into the armed state. During this pre-armed state alarm triggers are ignored. Pre-armed state can be reached from the alarmed state, the start inhibit state or the disarmed state. Pre-Arming of the alarm can be achieved by a press of the lock button on the remote key.

In the pre-armed state the visible and audible warnings are disabled.

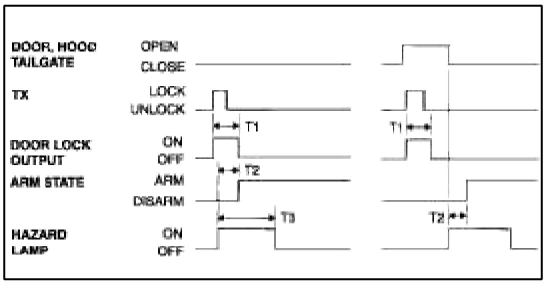
This system enters the armed state if it is in the pre-armed state and, after 0.6 sec, check actuator lock and each door, hood and tail gate close, and no door warning switch (no key in ignition).

On entering the arm state, a single flash of the hazard lamps is given, period of cycle 2 second, duty rate 50%.

If TX lock signal is received when a door, tail gate or hood is open, then lock output is given and a flash of hazard is not given.

After the armed state is entered, if a lock signal is received then a single flash of the hazard lamps is given, period of cycle 2 second, duty rate 50%.

The armed state cannot be reached by locking the car with the keys.



Time specification

T1 : 0.5 sec.

T2 : Max. 2 sec.

T3 : 1.0 ± 0.2 sec.

2. DISARM FUNCTION

Disarming can be performed while the alarm is armed, or alarming, or after alarming. The alarm can be disarmed by the following methods :

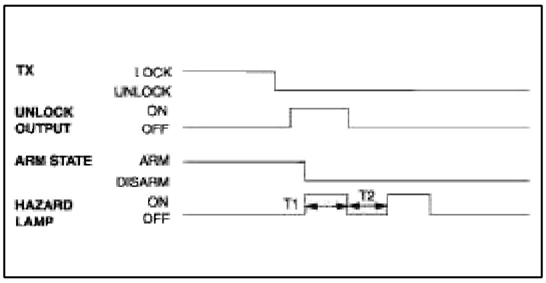
A. Pressing the unlock button on the TX key. The hazard lamps shall be flashed twice for 1sec period (of cycle), 50% duty rate.

B. If door warning switch is on, IGN1 and IGN2 are on in arm state, then arm state should be immediately cancelled. This means that the driver is inside the vehicle before pushing TX lock, so system should not arm.

In the disarm state the visible and audible warnings are disabled and start is enabled.

In the disarm state, if TX key unlock command is received, then the hazard lamps shall be flashed twice for period of cycle 1 sec, 50% duty rate.

Disarm state cannot be reached using the door locks by key.



Time specification

T1, T2 : 0.5 ± 0.1 sec.

3. ALARM FUNCTION

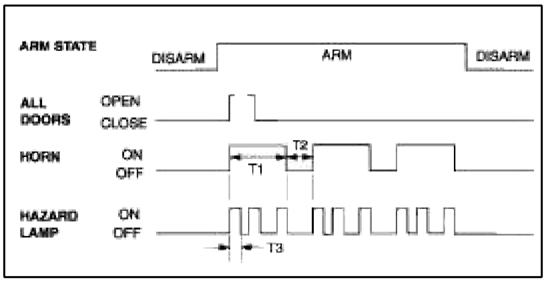
Once armed, should any door, hood or the tailgate be opened, then.

A. Start relay drive output is disabled, so starting is inhibited

B. Audible (horn) and visual (hazard lamp) warnings are issued, for three cycles, each cycle 27±2 sec. duration on, 10±1 sec. off. The horn warning is continuously occurring during the on period. The hazard lamps operate with 1 sec period, 50 % duty rate during the on period

The alarm is given in the case where a door is opened with a key.

After this time, the system maintains the start inhibit state, where no audible and visual warnings are issued but engine starting is not possible.



Time specification

T1 : 27 ± 2 sec.

T2 : 10 ± 1sec.

T3 : 0.4~0.5 sec.

4. OPERATION DURING ALARM CONDITIONS

(1) Cancelling audible alarm with the remote transmitter.

CASE 1 : Door closed

During or after alarming and then closing all doors and a TX lock signal is received Then

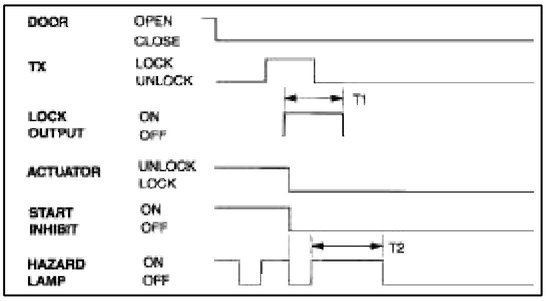
A. The lock command is executed with 0.5 sec. ON

B. Horn and start inhibition are OFF

C. Hazard lamp is flashed one time (period : 2 sec., duty: 50%, within 2 sec.)

D. The state goes to arming mode (after a lock state check)

E. The start is enabled


DOOR
OPEN
CLOSE
TX
LOCK
UNLOCK
T1
LOCK OUTPUT
ON
OFF
ACTUATOR
UNLOCK
LOCK
START INHIBIT
ON
OFF
T2
HAZARD LAMP
ON
OFF

Time specification

T1 : 0.5 sec.

T2 : 1.0 ± 0.2 sec.

CASE 2 : Door Open

During or after alarming, with a door open and a TX lock signal is received Then

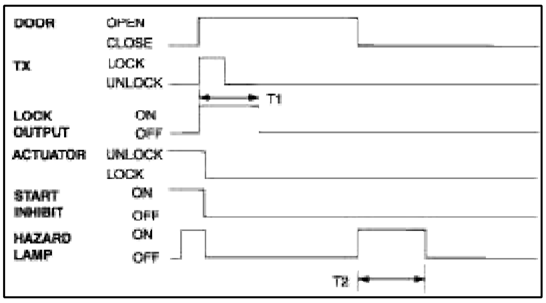
A. The lock command is executed with 0.5 sec. ON

B. Horn is disabled and start is enabled after confirmation of actuator lock

At this time, when the door is closed,

A. Hazard lamp is flashed one time (period : 2 sec., duty 50%)

B. The state goes to arming mode


DOOR
OPEN
CLOSE
TX
LOCK
UNLOCK
T1
LOCK OUTPUT
ON
OFF
ACTUATOR
UNLOCK
LOCK
START INHIBIT
ON
OFF
HAZARD LAMP
ON
OFF
T2

Time specification

T1 : 0.5 sec.

T2 : 1.0 ± 0.2 sec.

(2) New alarm conditions

Second alarm condition during alarming.

When another alarm occurs during alarming, the starting is disabled, and the alarm continues to sound for the remained time of warning signal. The alarm continues to sound after the second alarm condition is removed.

New alarm condition occurs after alarming (with all entrances closed)

If any entrance is opened again then

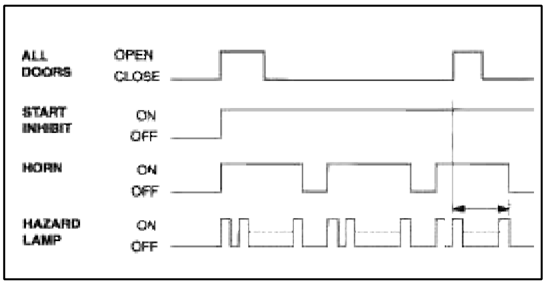
A. The horn is ON 3 times

B. Start is disabled

C. Hazard lamps flash during the ON time of horn

New alarm condition occur after alarming (with any entrance open).

If another entrance is opened, the ETACS module keeps start disabled and there is no horn output.


ALL DOORS
OPEN
CLOSE
START INHIBIT
ON
OFF
HORN
ON
OFF
HAZARD LAMP
ON
OFF

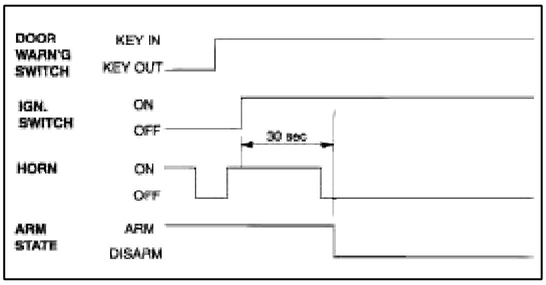
(3) Key operation during alarm

After the alarm state or start inhibit state are entered, if door warning switch on (key in ignition) &IGN 2 ON, if IGN 2 state is changed to OFF within 30sec, remain in alarm state.

(4) Disarming using the key

During alarming, in case that door warning switch (key in) is ON and then IGN1 and IGN2 are both ON for 30 sec continuously, the alarm is cancelled, and the system enters the disarm state.

After alarming, in case that door warning switch (key in) is ON and then IGN1 and IGN2 are both ON for 30 sec continuously, the alarm is cancelled, and the system enters the disarm state.


DOOR WARN'G SWITCH
KEY IN
KEY OUT
IGN. SWITCH
ON
OFF
30 sec
HORN
ON
OFF
ARM STATE
ARM
DISARM

5. **ALARM STATE IN POWER DOWN**

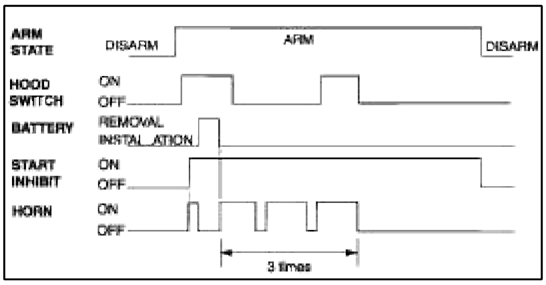
If the battery is disconnected to the ETACS module in the following states :

A. Alarm

B. After alarming

Upon restoring the battery, the alarm state shall be entered and the alarm cycle shall restarted (timer reset to 0).

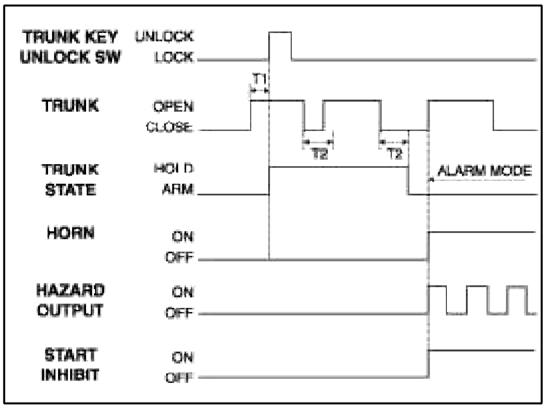
Upon restoring the battery, the alarm state shall be entered and the alarm cycle shall restart (timer reset to 0).


ARM STATE
DISARM
ARM
DISARM
HOOD SWITCH
ON
OFF
BATTERY
REMOVAL
INSTALLATION
START INHIBIT
ON
OFF
HORN
ON
OFF
3 times

6. **ALARM HOLD MODE**

(1) In case of opening the trunk by trunk unlock switch during arm state, the alarming is hold.
When received transmitter (TX) trunk signal in arm state, trunk open by output trunk lid open relay signal for 500ms and then holding alarm.
But the door and hood except trunk is still in the arm state.

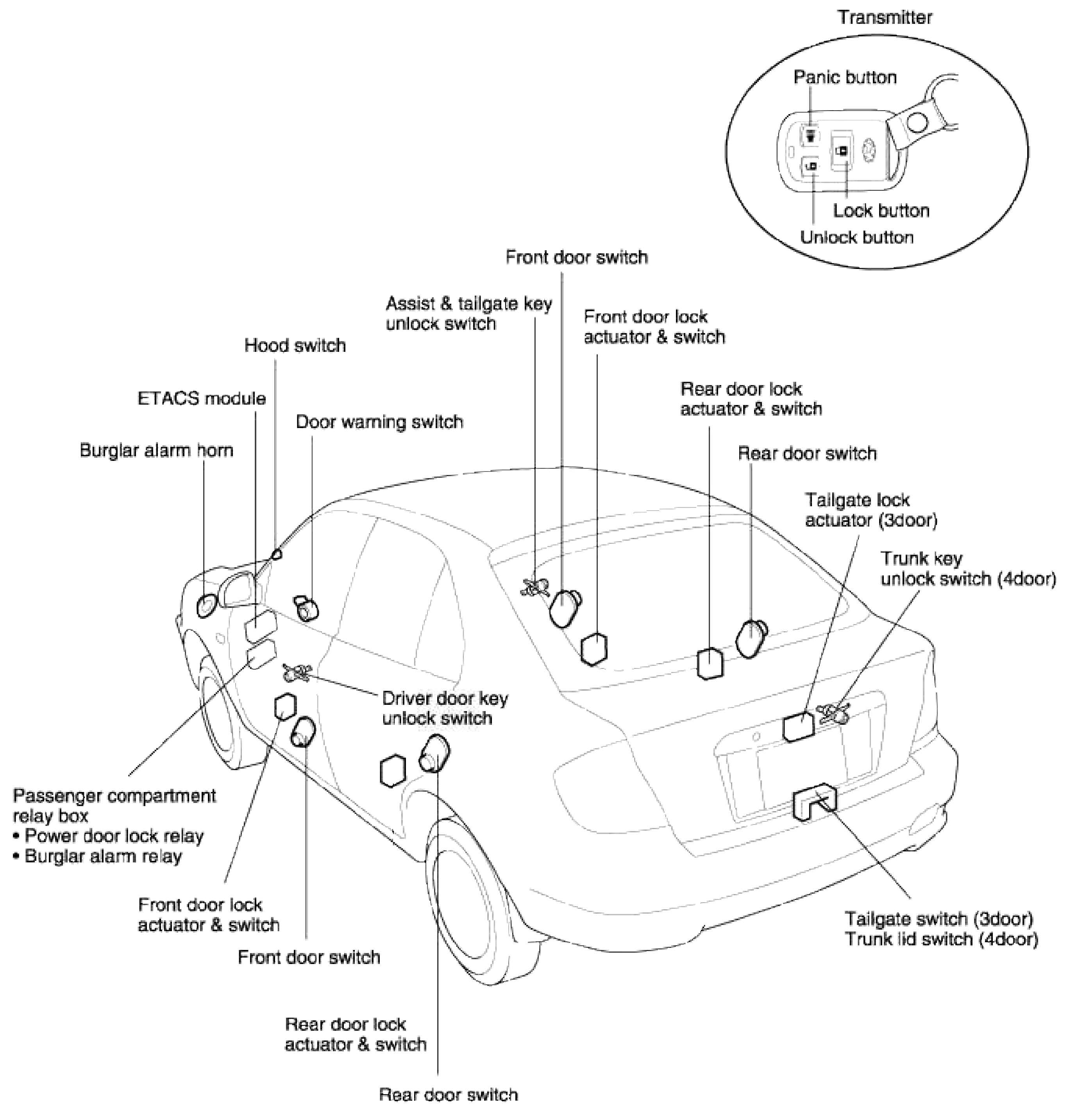
(2) Trunk is going to the arm state just case trunk is still closed for 2 sec.


TRUNK KEY UNLOCK SW
UNLOCK
LOCK
T1
TRUNK
OPEN
CLOSE
T2
T2
TRUNK STATE
HOLD
ARM
ALARM MODE
HORN
ON
OFF
HAZARD OUTPUT
ON
OFF
START INHIBIT
ON
OFF

T1 : Max. 0.2 sec., T2 : 2 sec.

Body Electrical System > Keyless Entry And > Components and Components Location

COMPONENTS


Transmitter
Panic button
Lock button
Unlock button
Front door switch
Assist & tailgate key unlock switch
Front door lock actuator & switch
Hood switch
ETACS module
Door warning switch
Rear door lock actuator & switch
Burglar alarm horn
Rear door switch
Tailgate lock actuator (3door)
Trunk key unlock switch (4door)
Driver door key unlock switch
Passenger compartment relay box
• Power door lock relay
• Burglar alarm relay
Front door lock actuator & switch
Front door switch
Tailgate switch (3door)
Trunk lid switch (4door)
Rear door lock actuator & switch
Rear door switch

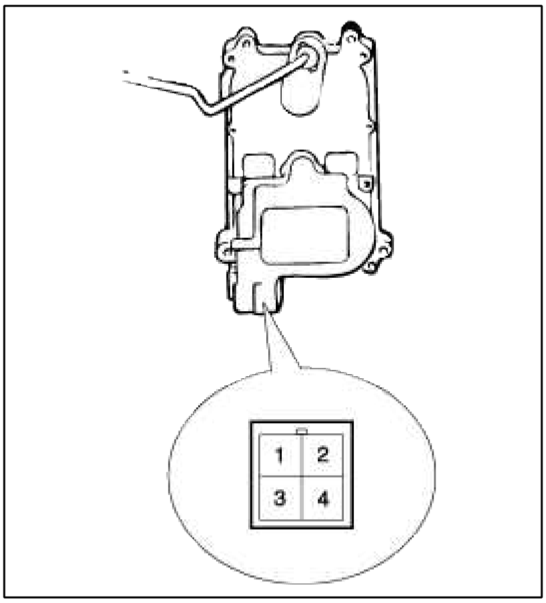
Body Electrical System > Keyless Entry And > Repair procedures

INSPECTION

FRONT DOOR LOCK ACTUATOR INSPECTION

1. Remove the front door trim panel. (see BD group-front door)

2. Disconnect the 4P connector from the actuator.

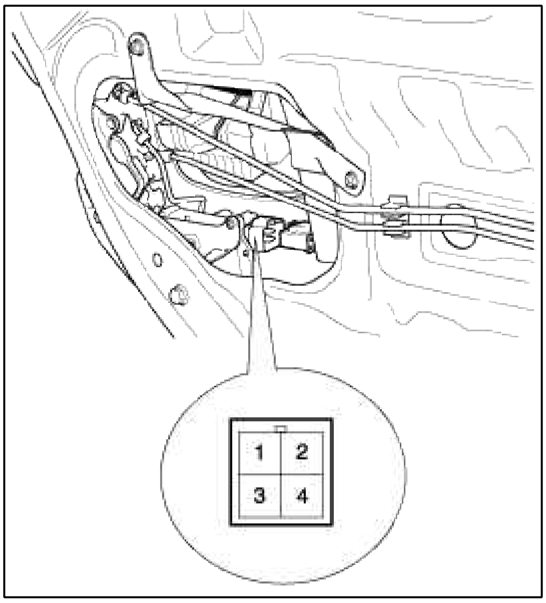


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		2	4
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Front right	Lock	⊖	⊕
	Unlock	⊕	⊖

REAR DOOR LOCK ACTUATOR INSPECTION

1. Remove the rear door trim panel. (see BD group-rear door)
2. Disconnect the 4P connector from the actuator.

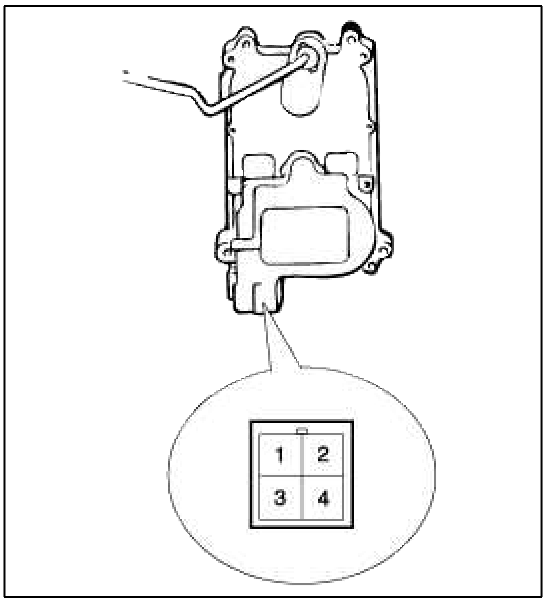


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		2	4
Rear left	Lock	⊖	⊕
	Unlock	⊕	⊖
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

FRONT DOOR LOCK SWITCH INSPECTION

1. Remove the front door trim panel. (see BD group-front door)
2. Disconnect the 4P connector from the actuator.

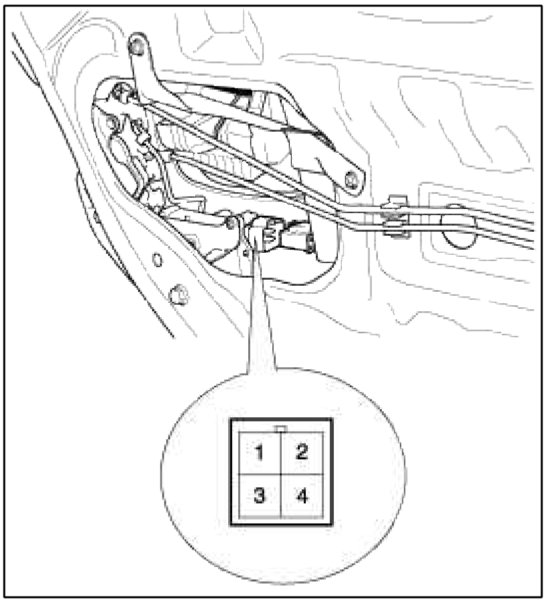


3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	3
Front left	Lock		
	Unlock	○	○
Front right	Lock		
	Unlock	○	○

REAR DOOR LOCK SWITCH INSPECTION

1. Remove the rear door trim panel. (see BD group-rear door)
2. Disconnect the 4P connector from the actuator.

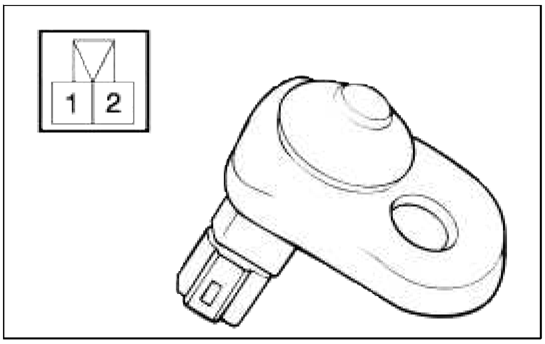


3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	3
Rear left	Lock		
	Unlock	○	○
Rear right	Lock		
	Unlock	○	○

DOOR SWITCH INSPECTION

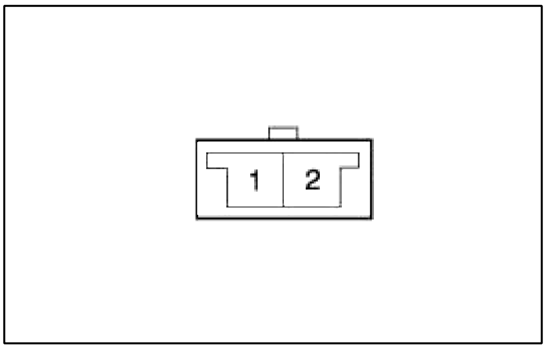
Remove the door switch and check for continuity between the terminals.



Terminal / Position	Ground(Body)	1	2
Free(Door open)	○	○	○
Push(Door close)			

TAILGATE LOCK ACTUATOR INSPECTION (3 DOOR)

1. Remove the tailgate trim panel. (see BD group-tailgate)
2. Disconnect the 2P connector from the actuator.

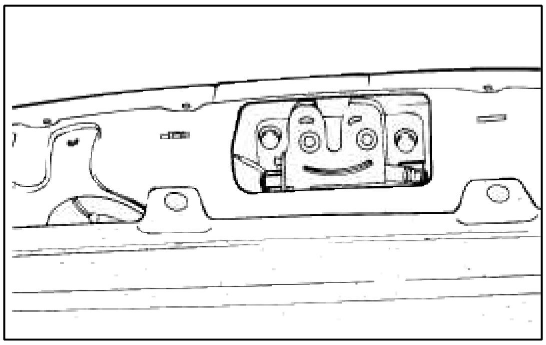


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Terminal / Position	1	2
LOCK→UNLOCK	⊖	⊕
UNLOCK→LOCK	⊕	⊖

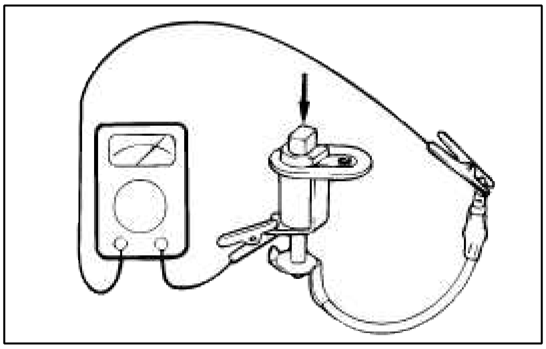
TRUNK LID SWITCH INSPECTION (4DOOR)

1. Disconnect the negative battery terminal.
2. After opening the trunk, disconnect the connector from the rear harness.



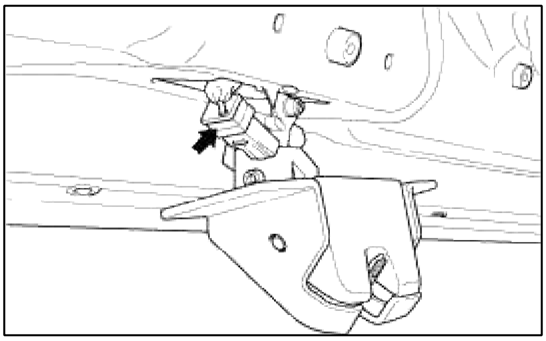
3. Check for continuity between the terminal and body while pushing the rod.

Switch rod condition	Continuity
Push (OFF)	Non-conductive (∞Ω)
Released (ON)	Conductive (0Ω)



TAILGATE SWITCH INSPECTION (3 DOOR)

1. Remove the tailgate trim panel. (see BD group-tailgate)
2. Remove the tailgate latch after removing 3 bolts and disconnect the 1P connector from the tailgate switch.

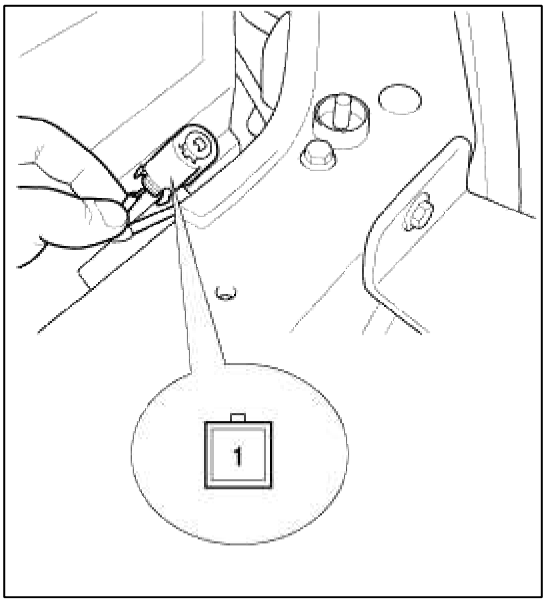


3. Check for continuity between the terminal and ground according to the table.

Terminal Position	Ground (Body)	1
Tailgate open	○	○
Tailgate close		

HOOD SWITCH INSPECTION

1. Disconnect the 1P connector from the hood switch.

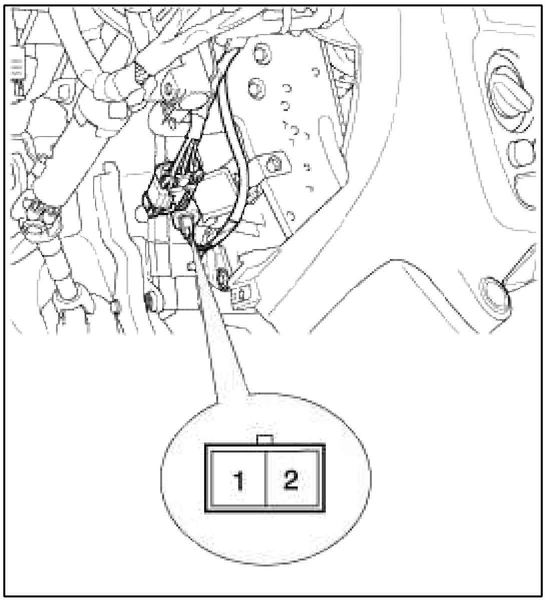


2. Check for continuity between the terminal and ground according to the table.

Terminal Position	Ground (Body)	1
Hood open (Free)	○	○
Hood close (Push)		

DOOR WARNING SWITCH INSPECTION

1. Remove the driver's crash pad lower panel. (see BD group-crash pad)
2. Disconnect the 2P connector from the door warning switch.

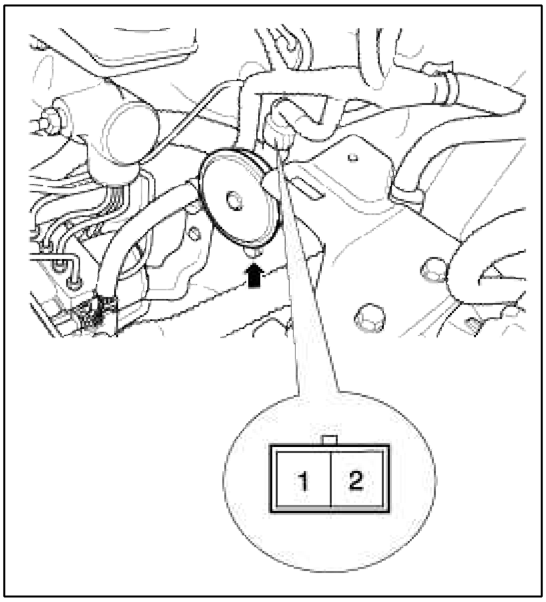


3. Check for continuity between the terminals in each position according to the table.

Terminal Key position	1	2
Insert	○	○
Removal		

BURGLAR ALARM HORN INSPECTION

1. Remove the horn after removing a bolt and disconnect the 2P connector from the horn.



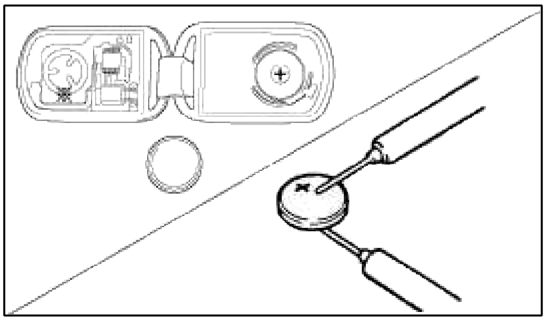
2. Test the horn by connecting battery power to terminal 1 and ground terminal 2.
   The horn should make a sound. If the horn fails to make a sound replace it.

Body Electrical System > Keyless Entry And > Transmitter > Repair procedures

INSPECTION

1. Check that the red light flickers when the door lock or unlock button is pressed on the transmitter.
2. Remove the battery and check voltage if the red light doesn't flicker.

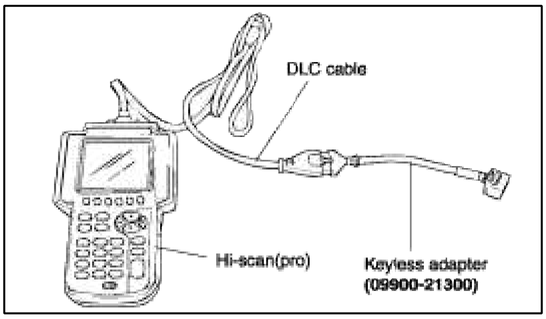
Standard voltage : 3V



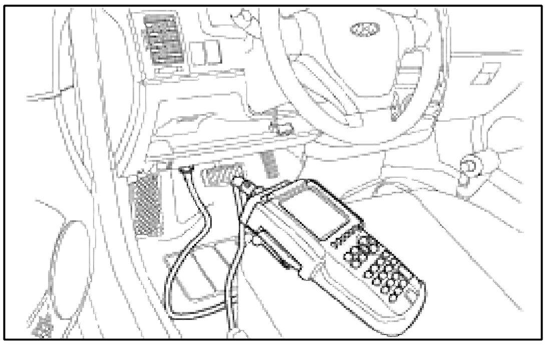
3. Replace the transmitter battery with a new one, if voltage is below 3V then try to lock and unlock the doors with the transmitter by pressing the lock or unlock button five or six times.
4. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, register the transmitter code, then try to lock and unlock the doors (See page BE-31)
5. If the doors lock and unlock, the transmitter is O.K, but if the doors don't lock and unlock, replace the transmitter.

TRANSMITTER CODE REGISTRATION

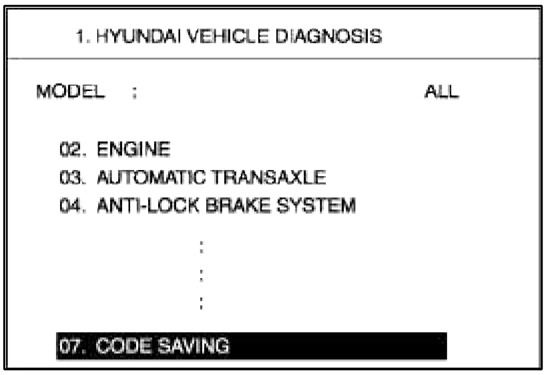
1. To register transmitter code, first connect keyless adapter (09900-21300) to DLC(Data Link Connector) cable of hi-scan as shown in the illustration.



2. After connecting keyless adapter to the multi purpose check connector (10pins) beside data link connector in driver side crash pad lower panel, turn the power on hi-scan.



3. Select the vehicle model and then do "CODE SAVING".

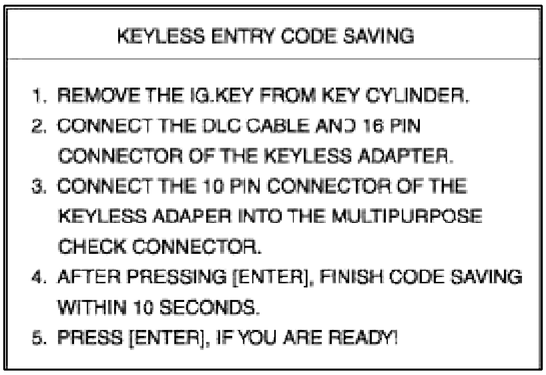


1. HYUNDAI VEHICLE DIAGNOSIS

MODEL : ALL

02. ENGINE
03. AUTOMATIC TRANSAXLE
04. ANTI-LOCK BRAKE SYSTEM
:
:
:
07. CODE SAVING

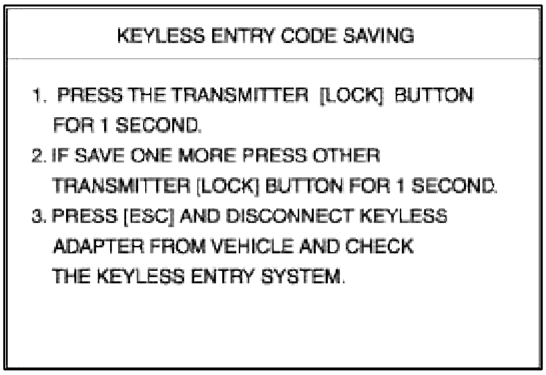
4. After selecting "CODE SAVING" menu, button "ENTER" key, then the screen will be shown as below.



KEYLESS ENTRY CODE SAVING

1. REMOVE THE IG.KEY FROM KEY CYLINDER.
2. CONNECT THE DLC CABLE AND 16 PIN CONNECTOR OF THE KEYLESS ADAPTER.
3. CONNECT THE 10 PIN CONNECTOR OF THE KEYLESS ADAPER INTO THE MULTIPURPOSE CHECK CONNECTOR.
4. AFTER PRESSING [ENTER], FINISH CODE SAVING WITHIN 10 SECONDS.
5. PRESS [ENTER], IF YOU ARE READY!

5. After removing the ignition key from key cylinder, push "ENTER" key to proceed to the next mode for code saving.



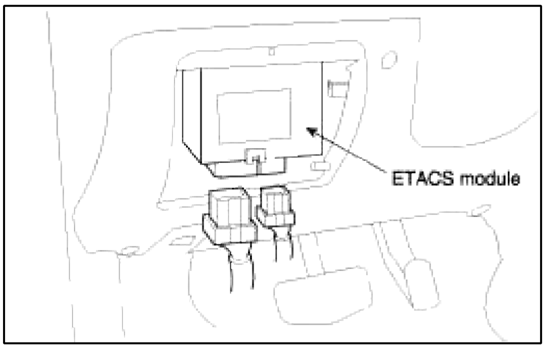
KEYLESS ENTRY CODE SAVING

1. PRESS THE TRANSMITTER [LOCK] BUTTON FOR 1 SECOND.
2. IF SAVE ONE MORE PRESS OTHER TRANSMITTER [LOCK] BUTTON FOR 1 SECOND.
3. PRESS [ESC] AND DISCONNECT KEYLESS ADAPTER FROM VEHICLE AND CHECK THE KEYLESS ENTRY SYSTEM.

6. Follow steps 1 to 3 and then code saving is completed.
7. Disconnect keyless adapter (09900-21300) from DLC cable and then proceed to self-diagnosis with DLC cable connected.

Body Electrical System > ETACS (Electronic Time > Description and Operation

DESCRIPTION

ETACS module receives various input switch signals, and controls time and alarm such as intermittent wiper timer, washer timer, rear defogger timer, seat belts warning, decayed out room lamp, central door lock, ignition key reminder, power window timer, door warning, tail lamp auto cut, crash door unlock and keyless entry & burglar alarm automatically.	

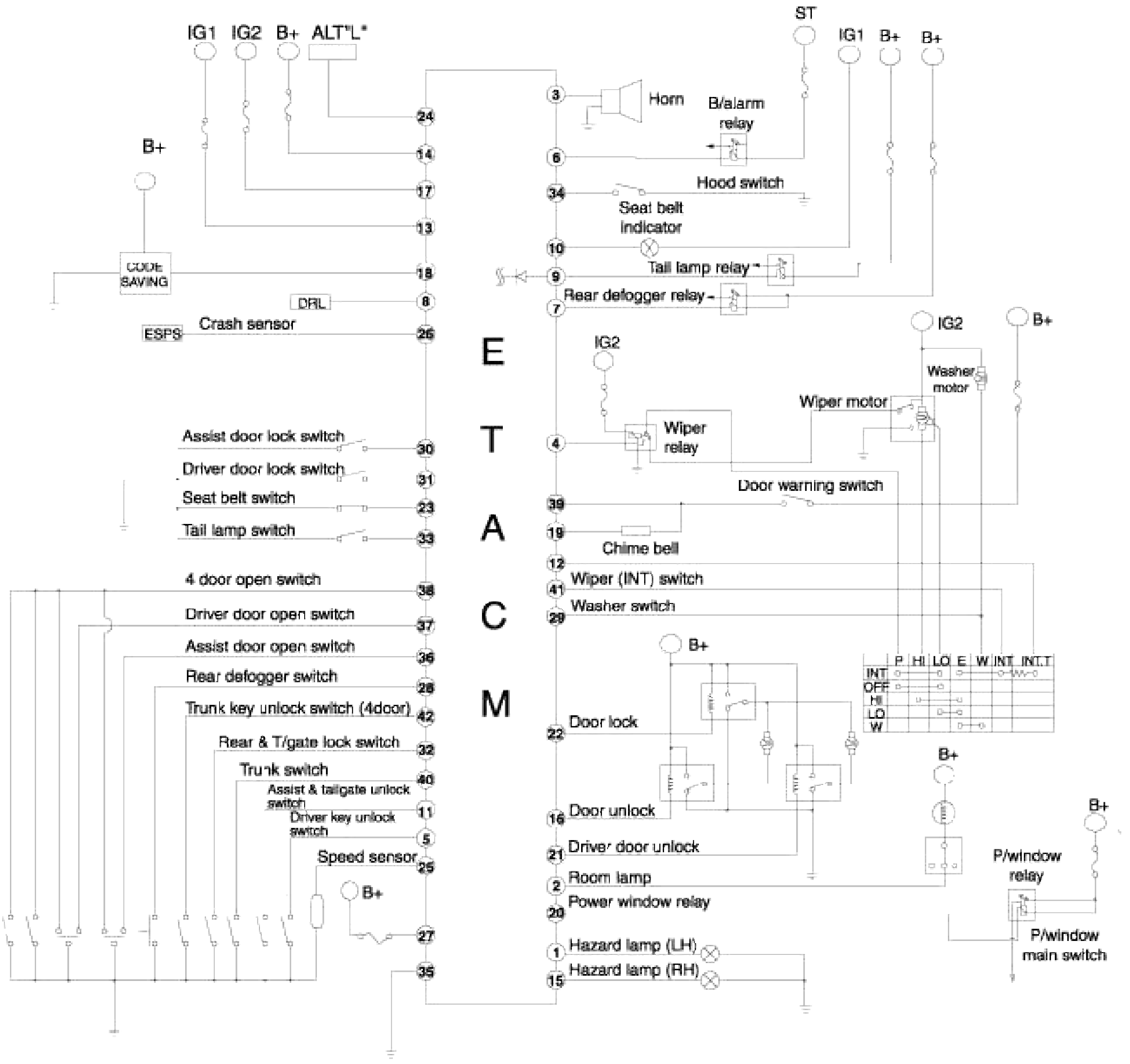
Body Electrical System > ETACS (Electronic Time > Specifications

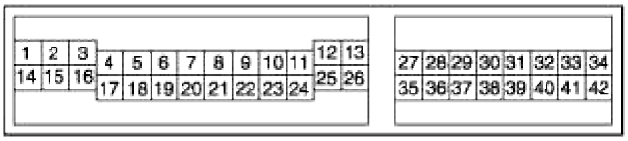
SPECIFICATIONS

Items	Specifications
Rated voltage	DC 12V
Operating voltage	DC 9 ~ 16V
Operating temperature	-30°C ~ 80°C
Insulation resistance	100MΩ or more
Rated load Horn relay Chime bell Rear defogger relay Hazard lamp relay Tail lamp relay Seat belt warning indicator Room lamp Door lock relay Door unlock relay Burglar alarm relay	DC 12V, 200mA (Inductance load) DC 12V, 350mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 1.2W (Lamp load) DC 12V, 10W (Lamp load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load) DC 12V, 200mA (Inductance load)

Body Electrical System > ETACS (Electronic Time > ETACS Module > Schematic Diagrams

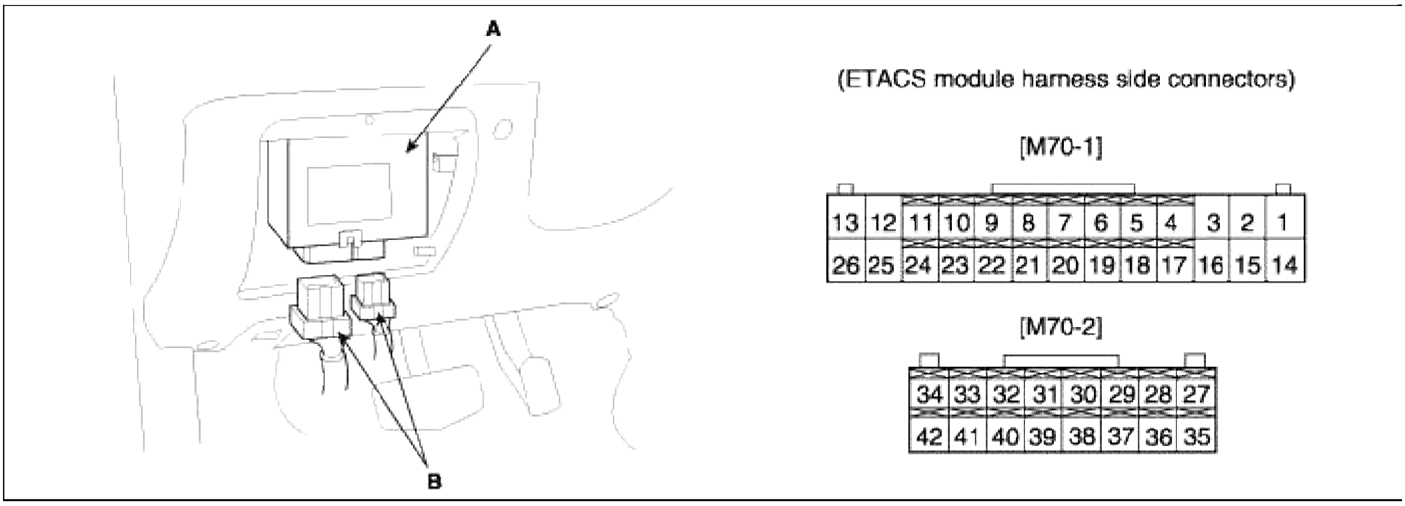
CIRCUIT DIAGRAM


IG1
IG2
B+
ALT"L"
ST
IG1
B+
B+
B+
CODE SAVING
DRL
ESPS
Crash sensor
Assist door lock switch
Driver door lock switch
Seat belt switch
Tail lamp switch
4 door open switch
Driver door open switch
Assist door open switch
Rear defogger switch
Trunk key unlock switch (4door)
Rear & T/gate lock switch
Trunk switch
Assist & tailgate unlock switch
Driver key unlock switch
Speed sensor
B+
E T A C M
Horn
B/alarm relay
Hood switch
Seat belt indicator
Tail lamp relay
Rear defogger relay
IG2
Wiper relay
Wiper motor
Washer motor
IG2
B+
Door warning switch
Chime bell
Wiper (INT) switch
Washer switch
B+
Door lock
Door unlock
Driver door unlock
Room lamp
Power window relay
Hazard lamp (LH)
Hazard lamp (RH)
B+
B+
P/window relay
P/window main switch
P HI LO E W INT INT.T
INT
OFF
HI
LO
W
24 14 17 13 18 8 26 30 31 23 33 38 37 36 28 42 32 40 11 5 25 27 35
3 6 34 10 9 7 4 39 19 12 41 29 22 16 21 2 20 1 15


1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
27 28 29 30 31 32 33 34
35 36 37 38 39 40 41 42

ETACS MODULE INPUT SIGNAL TEST

1. Disconnect the wire connectors(B) from the ETACS module(A).
2. Inspect the connectors(B) on wire harness side as shown in the below.


A
B
(ETACS module harness side connectors)
[M70-1]
13 12 11 10 9 8 7 6 5 4 3 2 1
26 25 24 23 22 21 20 19 18 17 16 15 14
[M70-2]
34 33 32 31 30 29 28 27
42 41 40 39 38 37 36 35

Terminal No.	Connection	Terminal No.	Connection
1	Hazard lamp (LH)	22	Door lock relay
2	Room lamp	23	Seat belt switch
3	Horn	24	Alternator "L"
4	Wiper relay	25	Speed sensor
5	Driver door key unlock switch	26	Crash sensor
6	Burglar alarm relay	27	B+
7	Rear defogger relay	28	Rear defogger switch
8	D.R.L	29	Washer switch
9	Tail lamp relay	30	Assist door lock switch
10	Seat belt warning lamp	31	Driver door lock switch
11	Assist & tailgate key unlock switch	32	Rear & tailgate lock switch
12	Intermittent wiper volume switch	33	Tail lamp switch
13	IGN1	34	Hood switch
14	B+	35	Ground
15	Hazard lamp (RH)	36	Assist door switch
16	Door unlock relay	37	Driver door switch
17	IGN2	38	All doors switch
18	Code saving	39	Door warning switch
19	Chime bell	40	Trunk switch (4door)/ Tailgate switch (3door)
20	Power window relay	41	Intermittent wiper switch
21	Driver door unlock relay	42	Trunk key unlock switch (4door)

ETACS MODULE INPUT SIGNAL TEST

Pin No.	Input signal name	Test condition	Desired result

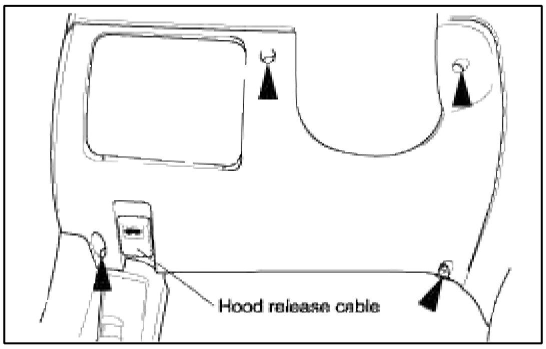
13	IGN1	Ignition switch ON or START	Check for voltage to ground; There should be battery voltage
17	IGN2	Ignition switch ON	Check for voltage to ground; There should be battery voltage
24	Alternator "L"	Engine start condition	Check for voltage to ground; There should be battery voltage
39	Door warning switch	Key is inserted into the ignition switch	Check for voltage to ground; There should be battery voltage
38	All door switch	One of all doors is opened	Check for continuity to ground; There should be continuity
37	Driver's door switch	Driver's door open	Check for continuity to ground; There should be continuity
36	Assist door switch	Assist door open	Check for continuity to ground; There should be continuity
32	Rear door lock switch	One of rear doors is unlock	Check for continuity to ground; There should be continuity
40	Trunk switch (4door) / Tailgate switch (3door)	Trunk open (4door) / Tailgate open (3door)	Check for continuity to ground; There should be continuity
42	Trunk key unlock switch (4door)	Key is inserted into the trunk key cylinder and turned	Check for continuity to ground; There should be continuity
34	Hood switch	Hood open	Check for continuity to ground; There should be continuity
29	Washer switch	Washer switch ON	Check for continuity to ground; There should be continuity
41	Intermittent wiper switch	INT. wiper switch ON	Check for continuity to ground; There should be continuity
12	Intermittent wiper volume switch	INT. wiper volume switch ON	Resistance should vary from 0Ω to 50kΩ
28	Rear defogger switch	Rear defogger switch ON	Check for continuity to ground; There should be continuity
33	Tail lamp switch	Tail lamp switch ON	Check for continuity to ground; There should be continuity
23	Seat belt switch	Seat belt is unbuckled	Check for continuity to ground; There should be continuity
18	Code saving tool	Code save signal	There should be open at unused
14, 27	Battery (+)	Constant	Check for voltage to ground ; There should be battery voltage
35	Ground	Constant	Check for continuity to ground ; There should be continuity
31	Driver's door lock switch	Driver's door is unlock	Check for continuity to ground ; There should be continuity

30	Assist door lock switch	Assist door is unlock	Check for continuity to ground ; There should be continuity
5	Driver's door key unlock switch	Driver's door is unlock with key	Check for continuity to ground ; There should be continuity
11	Assist & tailgate unlock switch	Assist door and tailgate are unlock with key	Check for continuity to ground : There should be continuity
26	Air bag signal	Ignition switch ON	Check for voltage to ground ; There should be about 5V

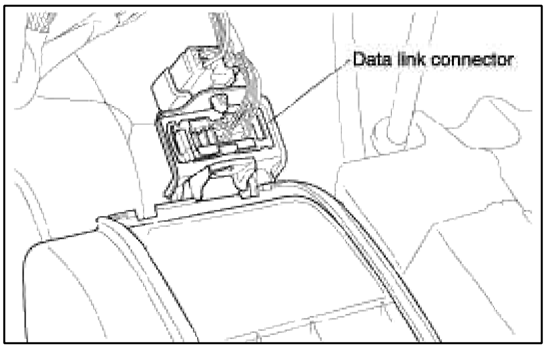
Body Electrical System > ETACS (Electronic Time > ETACS Module > Repair procedures

REMOVAL AND INSTALLATION

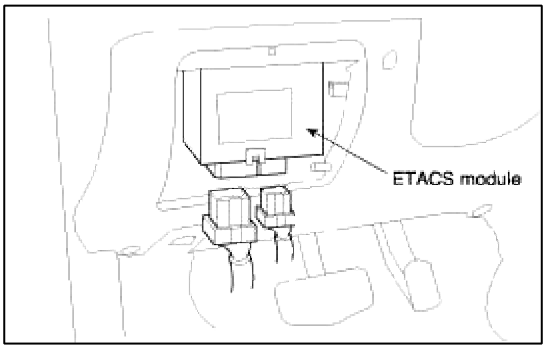
1. Disconnect the negative(-) battery terminal.
2. Remove the 2 screws and 2 bolts holding the driver's crash pad lower panel.



3. Disconnect the hood release cable and the data link connector from beneath the driver's crash pad lower panel.



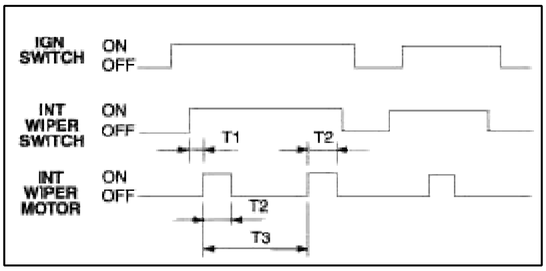
4. Remove the ETACS module from the bracket after removing bolts.



5. Installation is the reverse of removal.

INSPECTION

1. VEHICLE SPEED SENSING INTERMITTENT WIPER


IGN SWITCH
ON
OFF
INT WIPER SWITCH
ON
OFF
T1
T2
INT WIPER MOTOR
ON
OFF
T2
T3

Time specification

T1 : Max. 0.5sec.

T2 : 0.6~0.7 sec. (Time of wiper motor 1 rotation)

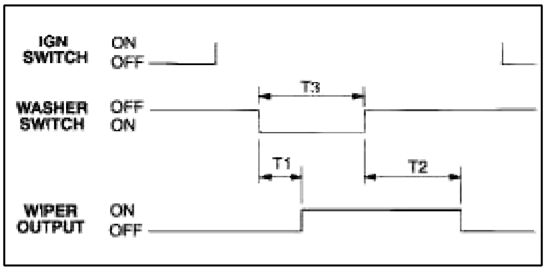
T3 : At vehicle speed : 0km/h.

2.6±0.7 sec. (VR=0kΩ)~18.0±1sec. (VR=50kΩ)

At vehicle speed = 100km/h or more.

1.0±0.2sec. (VR=0kΩ)~10.0±1 sec. (VR=50kΩ)

2. WASHER


IGN SWITCH
ON
OFF
T3
WASHER SWITCH
OFF
ON
T1
T2
WIPER OUTPUT
ON
OFF

A. Time specification
   T1 : 0.3 sec.
   T2 : 0.6~0.8 sec.
   T3 : 0.2~0.6 sec.

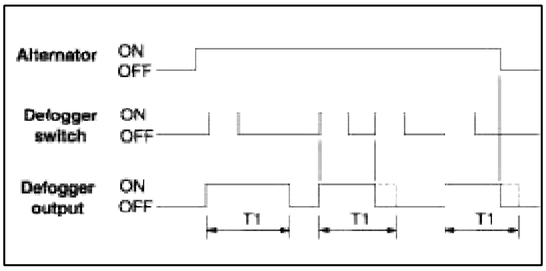
B. Time specification
   T1 : 0.3 sec.
   T2 : 2.5~3.8 sec.
   T3 : 0.6 sec. or more

C. This function should be operated preferentially even though the variable intermittent wiper is operating.

3. DEFOGGER TIMER (Including Outside Mirror Demister)

(1) After ALT "L" ON, if the defogger is switched ON, the defogger output is ON for 20 minutes duration.

(2) If the defogger switch is pressed again, or if the ignition is switched OFF during this time, the defogger output is OFF.


Alternator
ON
OFF
Defogger switch
ON
OFF
Defogger output
ON
OFF
T1
T1
T1

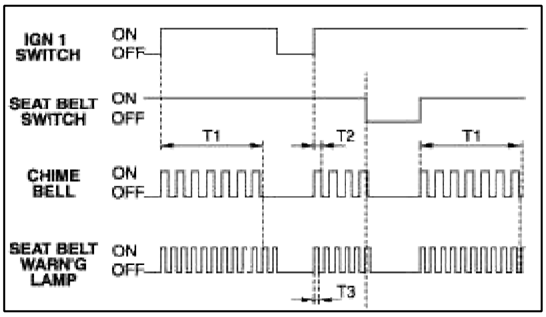
T1 : 20 ± 1min.

4. SEAT BELT WARNING TIMER

(1) Since the ignition is switched ON, the seat belt warning indicator is illuminated infinitely (with period : 0.6 sec., duty rate : 50%) and the chime bell is sounded (with period : 0.9 sec., duty rate : 50%) for total time 6 seconds.

(2) If the ignition is swithced off during the indicator and the chime bell output, the indicator and the chime bell are switched OFF.
If the seat belt is fastened during the indicator and the chime bell output, the indicator and the chime bell are switched OFF immediately.

(3) When the ignition is already switched ON, if the seat belt is not fastened, the chime bell is sounded for 6 second and the warning indicator is illuminated infinitely.


IGN 1 SWITCH
ON
OFF
SEAT BELT SWITCH
ON
OFF
T1
T2
T1
CHIME BELL
ON
OFF
SEAT BELT WARN'G LAMP
ON
OFF
T3

T1 : 6±1 sec., T2 : 0.45 ± 0.1 sec.,
T3 : 0.3 ± 0.1 sec.

5. DECAYED ROOM LAMP & KEYLESS UNLOCK TIMER

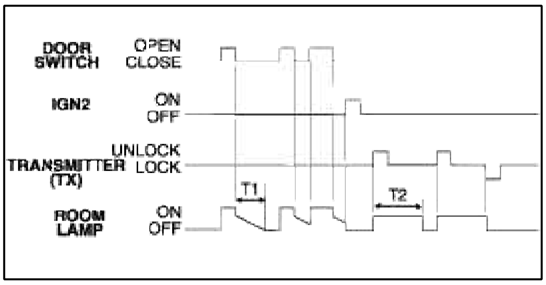
(1) When the first door (driver's or assist) is opened, the room lamp shall brighten. When the last door is closed, the room lamp will drop to 75% intensity, then fade out over 5-6 seconds.

(2) If the door switch is ON for less than 0.1 sec., then no illumination occurs.

(3) The fade resolution is over 32 steps.

(4) The room lamp must not flicker during fade operation, if the ignition is switched ON.

(5) With keyless UNLOCK, when the door is closed, the room lamp is turned ON, then OFF after about 30 seconds. While the room lamp is ON due to keyless UNLOCK, if another UNLOCK is received, the room lamp is again ON for 30 seconds.
While the room lamp is ON, If the door is opened, the lamp is continued to ON. If the door is closed, the lamp follows as the above step 1.
If keyless LOCK (ARM state) is received during fade out, the room lamp is switched off immediately.


DOOR SWITCH
OPEN
CLOSE
IGN2
ON
OFF
TRANSMITTER (TX)
UNLOCK
LOCK
T1
T2
ROOM LAMP
ON
OFF

T1 : 5.5 ± 0.5 sec., T2 : 30 ± 3 sec.

6. CENTRAL DOOR LOCK/UNLOCK

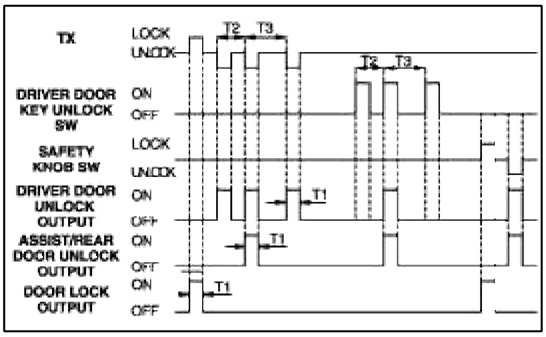
(1) If transmitter(TX) lock or key lock signal is received, all door lock output is ON.

(2) With driver door lock state, if TX unlock or key unlock signal is received, only driver door unlock output is ON.

(3) Within 4 sec. since final unlock signal, if TX unlock or key unlock signal is received again, all doors unlock output is ON at driver door unlock state.
If the time (4 sec.) elapse, only driver door unlock output is ON.

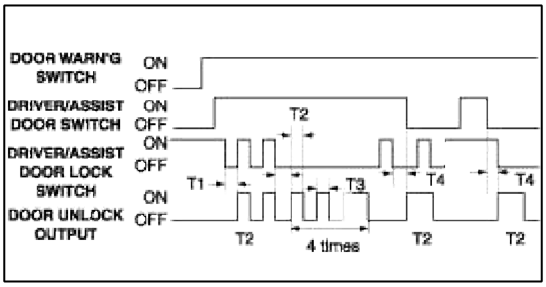
(4) Using safety knob, possible to central door lock/unlock.

(5) Door key unlock switch is applied to driver door, assist door and tailgate.


TX
LOCK
UNLOCK
T2
T3
DRIVER DOOR KEY UNLOCK SW
ON
OFF
SAFETY KNOB SW
LOCK
UNLOCK
DRIVER DOOR UNLOCK OUTPUT
ON
OFF
T1
ASSIST/REAR DOOR UNLOCK OUTPUT
ON
OFF
DOOR LOCK OUTPUT
ON
OFF

T1 : 0.5 ± 0.1 sec.
T2 : Max. 4 sec.
T3 : Min. 4 sec.

7. IGNITION KEY REMINDER


DOOR WARN'G SWITCH
ON
OFF
DRIVER/ASSIST DOOR SWITCH
ON
OFF
DRIVER/ASSIST DOOR LOCK SWITCH
ON
OFF
DOOR UNLOCK OUTPUT
ON
OFF
T1
T2
T3
T4
4 times

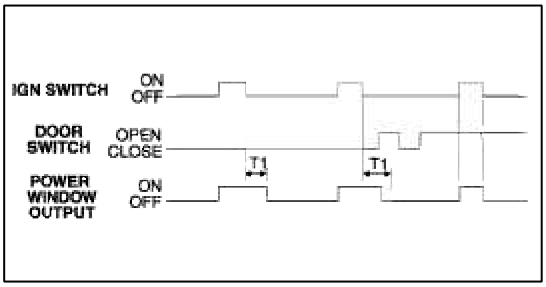
T1,T3 : 0.5 sec., T2 : 1 sec., T4 : Max.0.5 sec.

8. POWER WINDOW TIMER

(1) When the ignition is switched ON, the power window relay output is turned ON.

(2) When the ignition is switched OFF, the power window output is maintained ON for 30 seconds and then turned OFF.

(3) With the state of step 2, if the driver's door or assist door is opened, the output shall be turned OFF immediately.

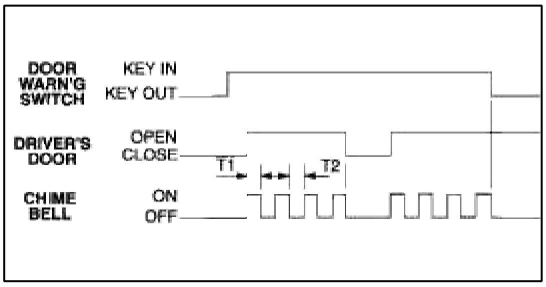

IGN SWITCH
ON
OFF
DOOR SWITCH
OPEN
CLOSE
T1
POWER WINDOW OUTPUT
ON
OFF

T1 : 30 ± 3 sec.

9. DOOR OPEN WARNING

(1) If the key is in the ignition key cylinder and the driver's door is opened, the chime bell sounds continually (period:0.9 sec. Duty rate:50%).

(2) If the door is closed or the key is removed, the chime stops immediately.


DOOR WARN'G SWITCH
KEY IN
KEY OUT
DRIVER'S DOOR
OPEN
CLOSE
T1
T2
CHIME BELL
ON
OFF

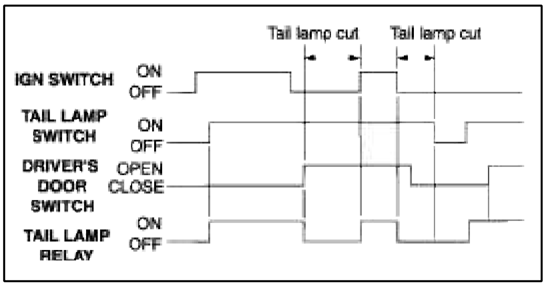
T1,T2 : 0.45 ± 0.1 sec.

10. TAIL LAMP AUTO CUT

(1) When the tail lamp is switched ON, if the ignition is switched OFF and the driver's door is opened, the tail lamp should be automatically OFF.

(2) With the ignition switched ON, if the driver's door is opened and the ignition is switched OFF, the tail lamp should be automatically OFF.

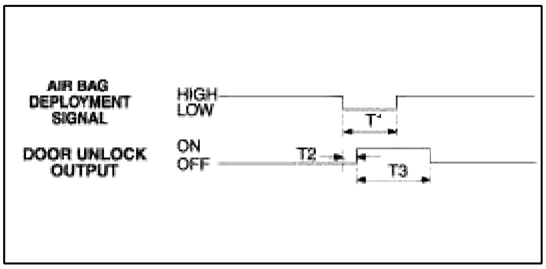
(3) When the tail lamp is cut automatically, if the tail lamp switch is turned OFF and ON, the tail lamp is illuminated and auto cut function is cancelled.


Tail lamp cut
Tail lamp cut
IGN SWITCH
ON
OFF
TAIL LAMP SWITCH
ON
OFF
DRIVER'S DOOR SWITCH
OPEN
CLOSE
TAIL LAMP RELAY
ON
OFF

11. CRASH DOOR UNLOCK

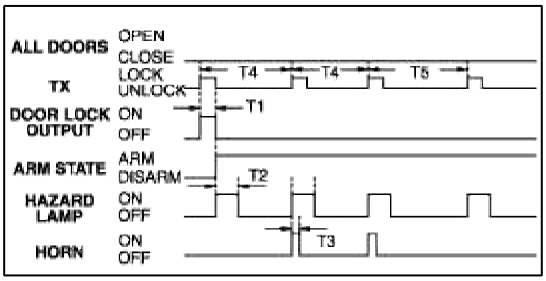
(1) With the ignition turned ON, if the air bag is deployed, a crash signal is received and send an UNLOCK output to all doors UNLOCK.

(2) After UNLOCK output, when LOCK is set, UNLOCK pulse is output for 5 second period again.


AIR BAG DEPLOYMENT SIGNAL
HIGH
LOW
T1
DOOR UNLOCK OUTPUT
ON
OFF
T2
T3

T1 : 200 msec.
T2 : 40 msec.
T3 : 5±0.5sec.

12. TX LOCK TWO TIMES FUNCTION


ALL DOORS
OPEN
CLOSE
TX
LOCK
UNLOCK
DOOR LOCK OUTPUT
ON
OFF
ARM STATE
ARM
DISARM
HAZARD LAMP
ON
OFF
HORN
ON
OFF
T4
T4
T5
T1
T2
T3

T1 : 0.5 ± 0.1 sec.

T2 : 1 ± 0.2 sec.

T3 : 0.05 sec.

T4 : Max. 4 sec.

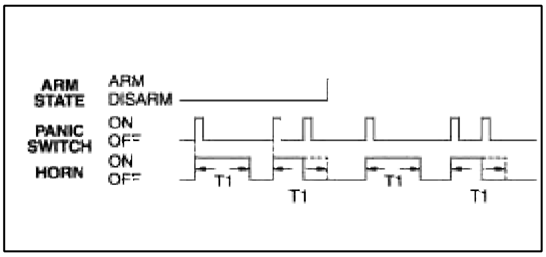
T5 : Min. 4 sec.

13. PANIC ALARM

(1) If panic switch is ON, horn output keeps ON for 30 sec and if panic switch is ON again, horn output is OFF.

(2) Panic mode is not affected at arm or disarm state.

(3) While panic is operating, arm or disarm function operates.

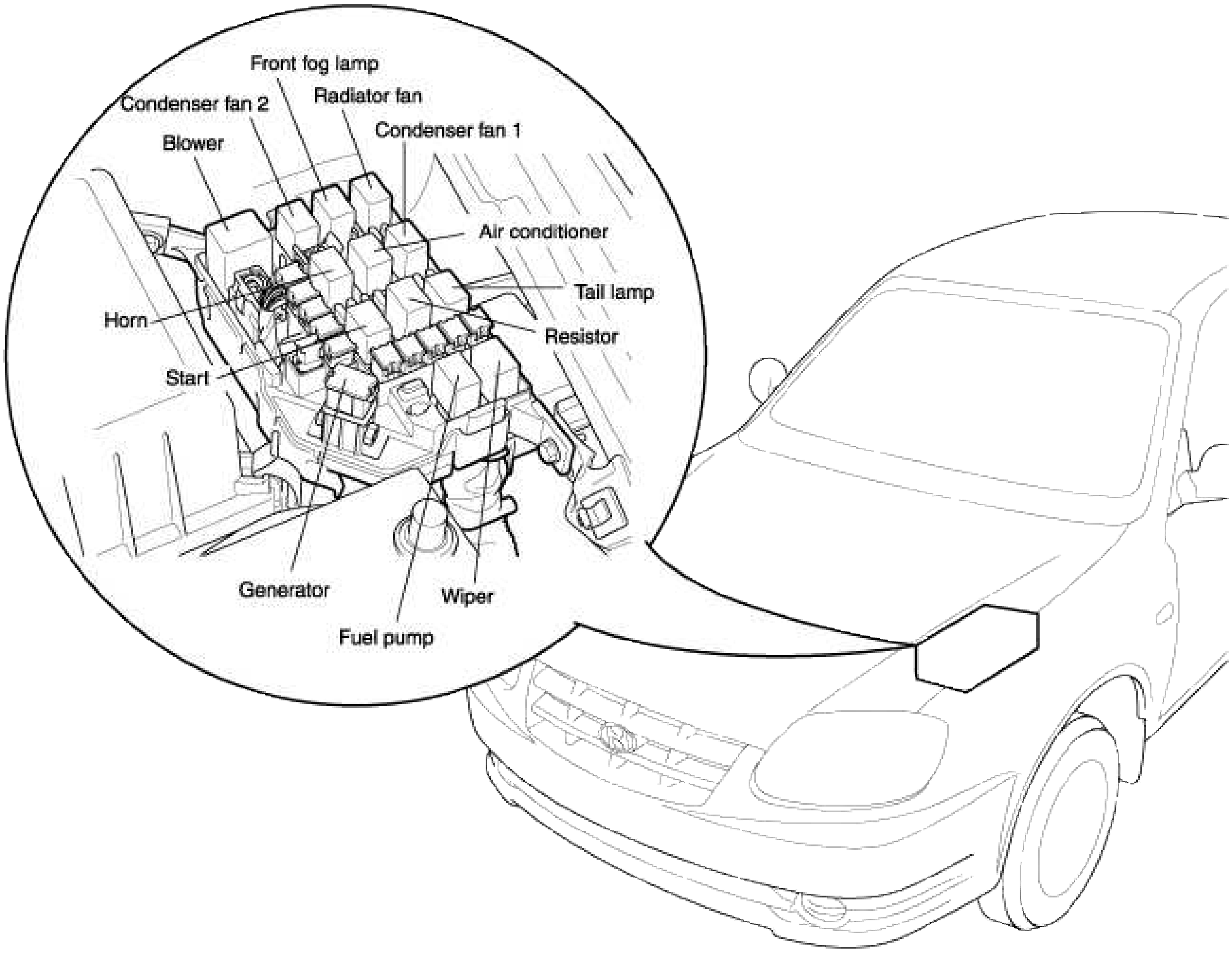

ARM STATE
ARM
DISARM
PANIC SWITCH
ON
OFF
HORN
ON
OFF
T1
T1
T1
T1

T1 : 30 ± 1 sec.

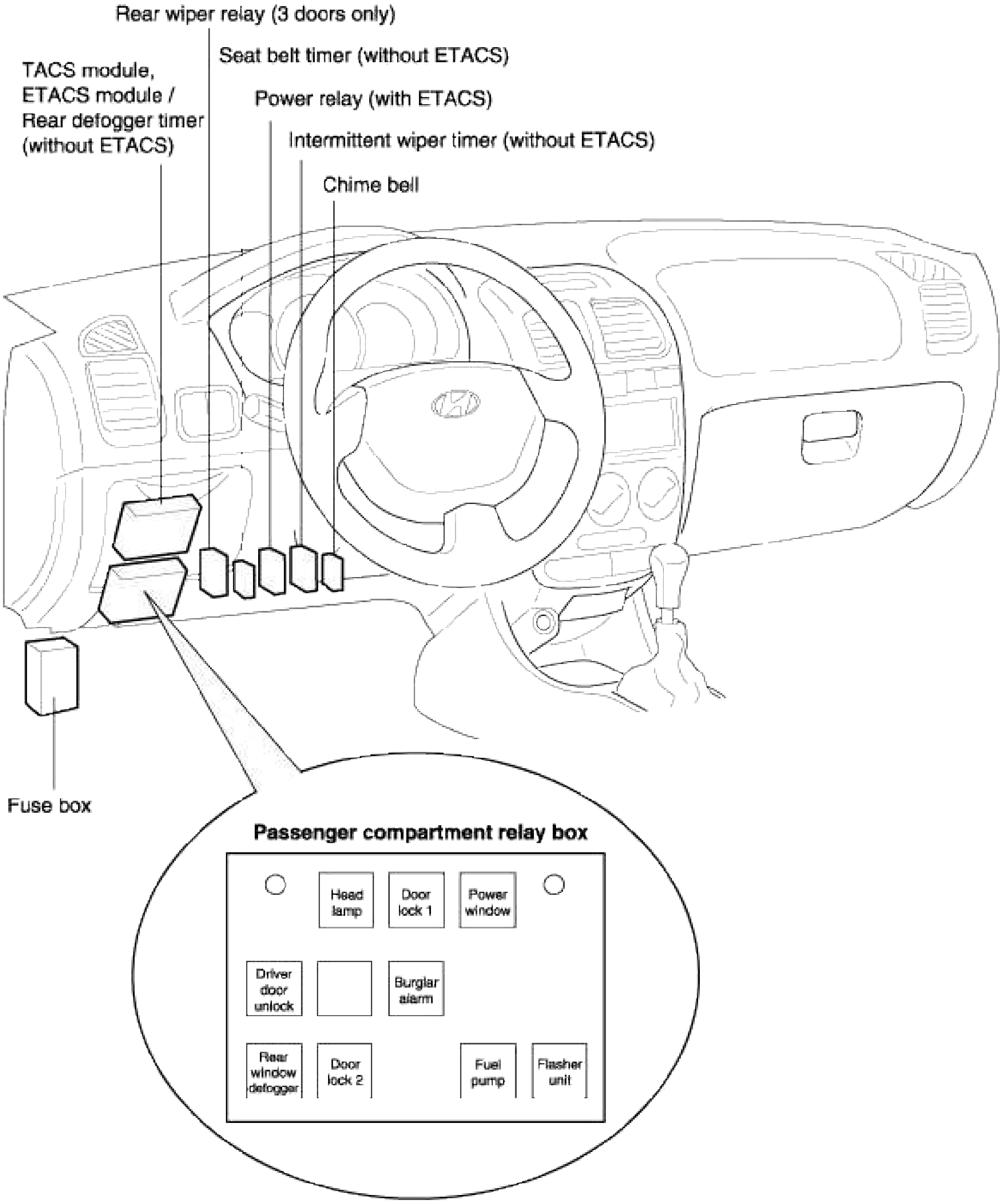
Body Electrical System > Fuses And Relays > Components and Components Location

COMPONENTS

[ENGINE COMPARTMENT RELAY BOX]

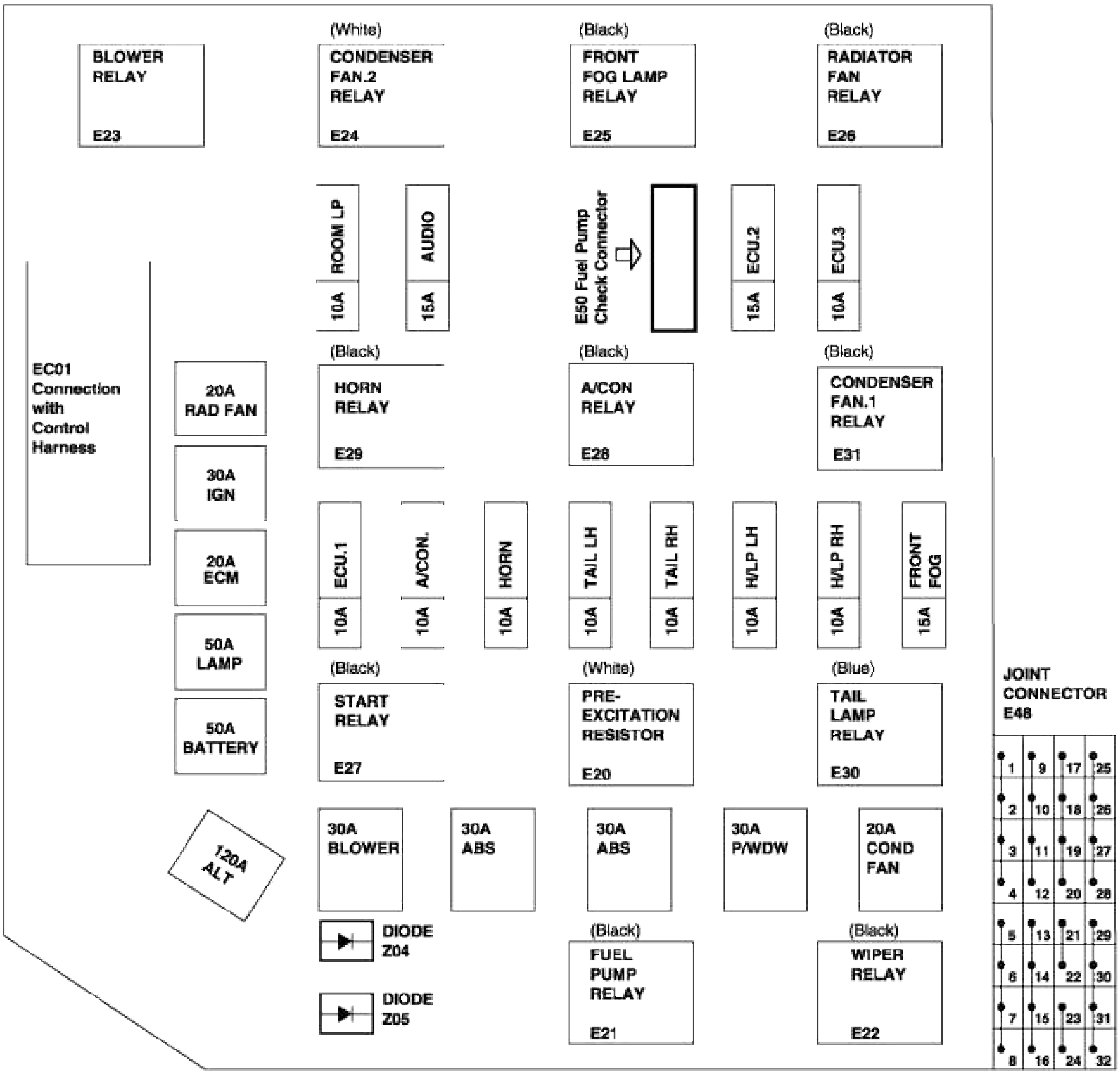

Front fog lamp
Condenser fan 2
Radiator fan
Condenser fan 1
Blower
Air conditioner
Tail lamp
Horn
Resistor
Start
Generator
Wiper
Fuel pump

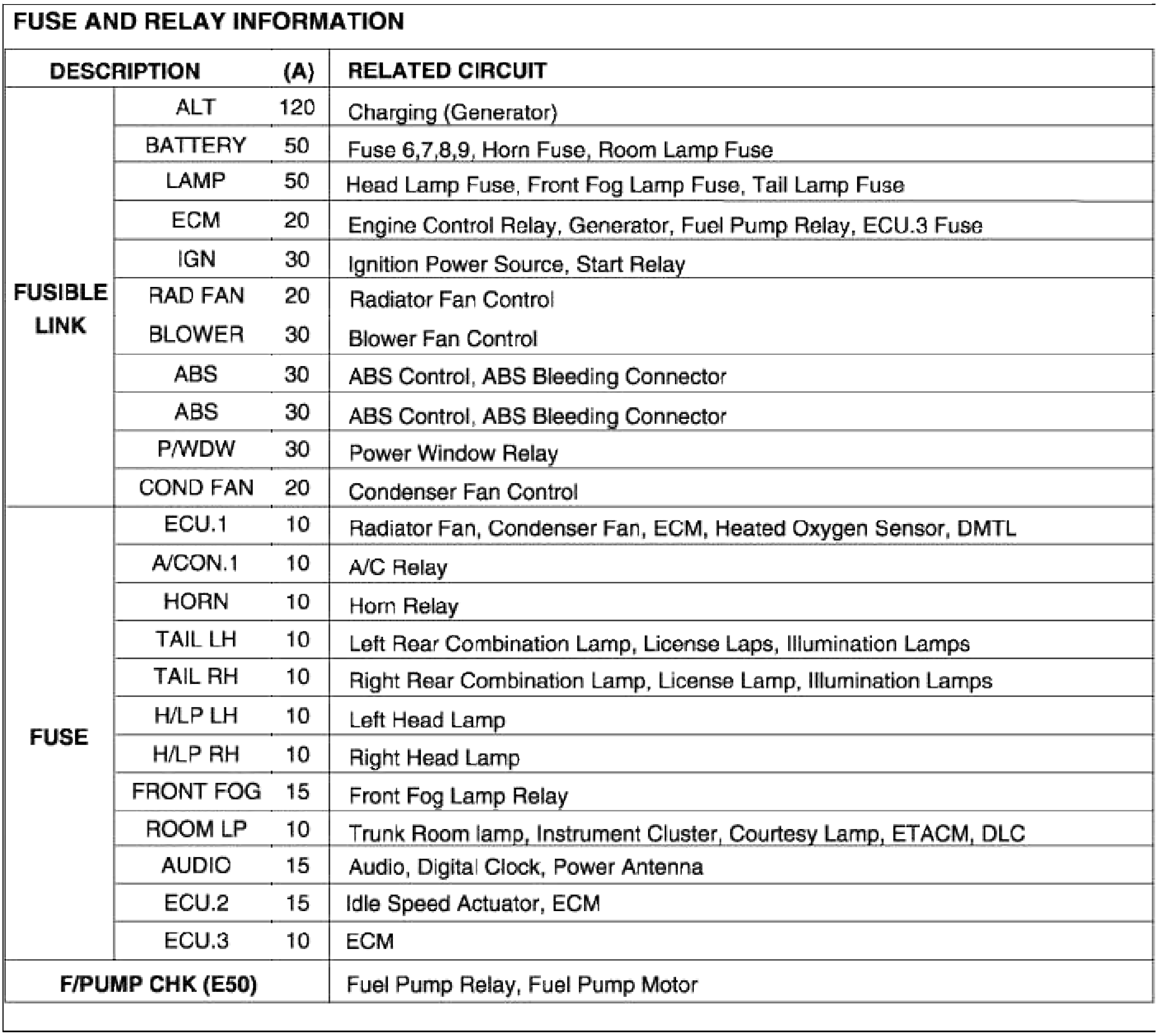
[PASSENGER COMPARTMENT RELAY BOX]


Rear wiper relay (3 doors only)
TACS module,
ETACS module /
Rear defogger timer
(without ETACS)
Seat belt timer (without ETACS)
Power relay (with ETACS)
Intermittent wiper timer (without ETACS)
Chime bell
Fuse box
Passenger compartment relay box
Head lamp
Door lock 1
Power window
Driver door unlock
Burglar alarm
Rear window defogger
Door lock 2
Fuel pump
Flasher unit

Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Components and Components Location

COMPONENTS


BLOWER RELAY E23
(White) CONDENSER FAN.2 RELAY E24
(Black) FRONT FOG LAMP RELAY E25
(Black) RADIATOR FAN RELAY E26
ROOM LP 10A
AUDIO 15A
E50 Fuel Pump Check Connector
ECU.2 15A
ECU.3 10A
EC01 Connection with Control Harness
20A RAD FAN
30A IGN
20A ECM
50A LAMP
50A BATTERY
(Black) HORN RELAY E29
(Black) A/CON RELAY E28
(Black) CONDENSER FAN.1 RELAY E31
ECU.1 10A
A/CON. 10A
HORN 10A
TAIL LH 10A
TAIL RH 10A
H/LP LH 10A
H/LP RH 10A
FRONT FOG 15A
(Black) START RELAY E27
(White) PRE-EXCITATION RESISTOR E20
(Blue) TAIL LAMP RELAY E30
JOINT CONNECTOR E48
120A ALT
30A BLOWER
30A ABS
30A ABS
30A P/WDW
20A COND FAN
DIODE Z04
DIODE Z05
(Black) FUEL PUMP RELAY E21
(Black) WIPER RELAY E22
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32



FUSE AND RELAY INFORMATION

DESCRIPTION		(A)	RELATED CIRCUIT
FUSIBLE LINK	ALT	120	Charging (Generator)
	BATTERY	50	Fuse 6,7,8,9, Horn Fuse, Room Lamp Fuse
	LAMP	50	Head Lamp Fuse, Front Fog Lamp Fuse, Tail Lamp Fuse
	ECM	20	Engine Control Relay, Generator, Fuel Pump Relay, ECU.3 Fuse
	IGN	30	Ignition Power Source, Start Relay
	RAD FAN	20	Radiator Fan Control
	BLOWER	30	Blower Fan Control
	ABS	30	ABS Control, ABS Bleeding Connector
	ABS	30	ABS Control, ABS Bleeding Connector
	P/WDW	30	Power Window Relay
	COND FAN	20	Condenser Fan Control
FUSE	ECU.1	10	Radiator Fan, Condenser Fan, ECM, Heated Oxygen Sensor, DMTL
	A/CON.1	10	A/C Relay
	HORN	10	Horn Relay
	TAIL LH	10	Left Rear Combination Lamp, License Laps, Illumination Lamps
	TAIL RH	10	Right Rear Combination Lamp, License Lamp, Illumination Lamps
	H/LP LH	10	Left Head Lamp
	H/LP RH	10	Right Head Lamp
	FRONT FOG	15	Front Fog Lamp Relay
	ROOM LP	10	Trunk Room lamp, Instrument Cluster, Courtesy Lamp, ETACM, DLC
	AUDIO	15	Audio, Digital Clock, Power Antenna
	ECU.2	15	Idle Speed Actuator, ECM
	ECU.3	10	ECM
F/PUMP CHK (E50)			Fuel Pump Relay, Fuel Pump Motor

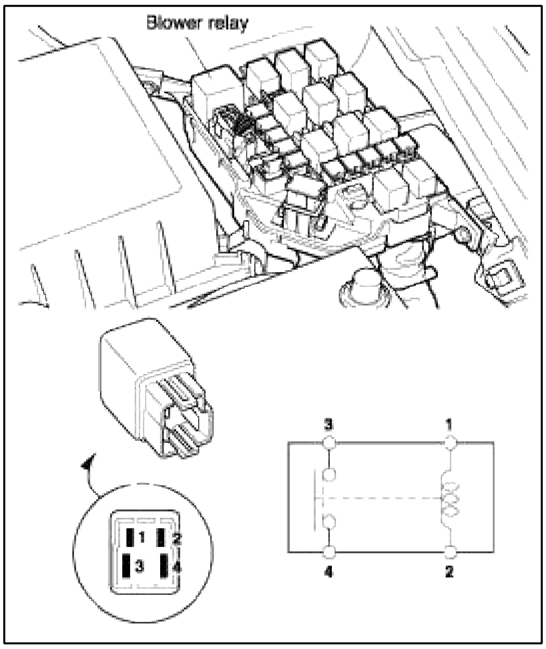
Body Electrical System > Fuses And Relays > Relay Box (Engine Compartment) > Repair procedures

INSPECTION

POWER RELAY TEST (TYPE A)

1. There should be continuity between the No.3 and No.4 terminals when power and ground are connected to the No.1 and No.2 terminals.

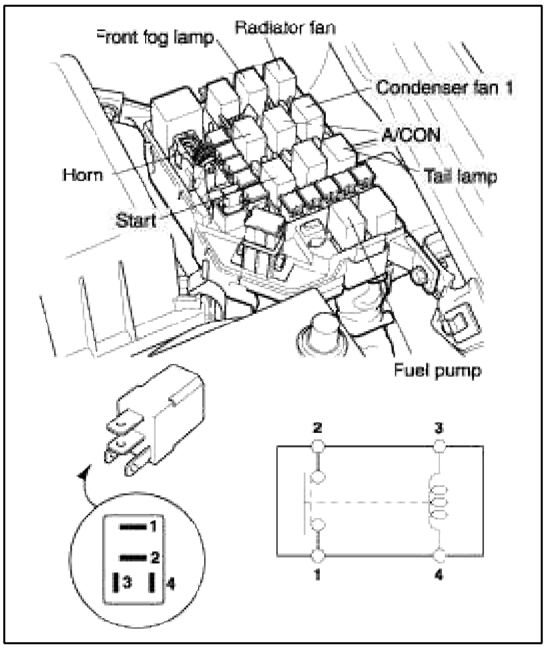
2. There should be no continuity between the No.3 and No.4 terminals when power is disconnected.


Blower relay
3
1
4
2
1
2
3
4

Terminal / Power (No.1-No.2)	1	2	3	4
Disconnected	○—	—○		
Connected	⊖—	—⊕	○—	—○

POWER RELAY TEST (TYPE B)

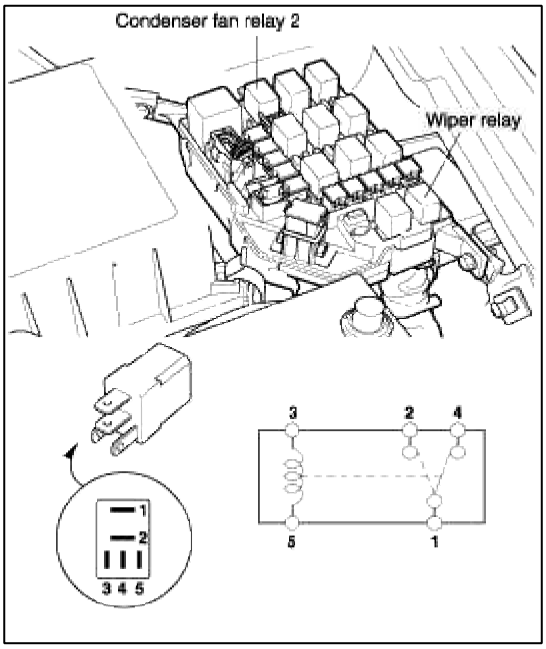
1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.4 and No.3 terminals.
2. There should be no continuity between the No.1 and No.2 terminals when power is disconnected.

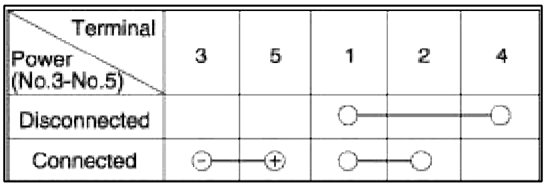

Front fog lamp
Radiator fan
Condenser fan 1
A/CON
Tail lamp
Horn
Start
Fuel pump
2
3
1
4
1
2
3
4

Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected			○—	—○
Connected	○—	—○	⊖—	—⊕

POWER RELAY TEST (TYPE C)

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.5 terminals.
2. There should be continuity between the No.1 and No.4 terminals when power is disconnected.


Condenser fan relay 2
Wiper relay
3
2
4
5
1
1
2
3 4 5



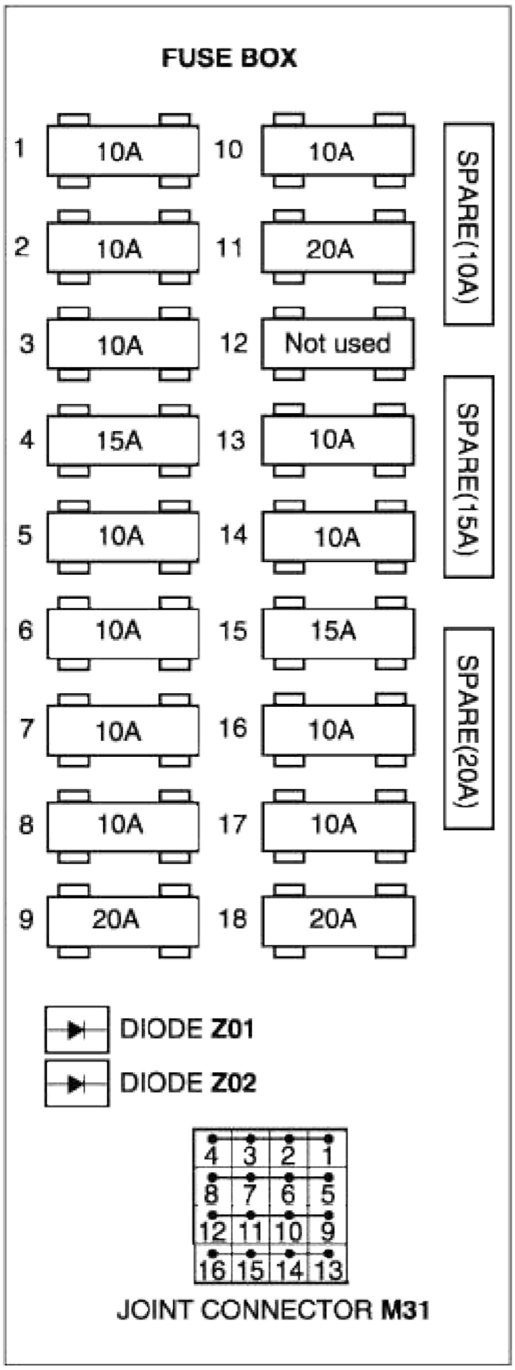
Terminal / Power (No.3-No.5)	3	5	1	2	4
Disconnected			○		○
Connected	⊖	⊕	○	○	

Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Components and Components Location

COMPONENTS

[DASH FUSE BOX]

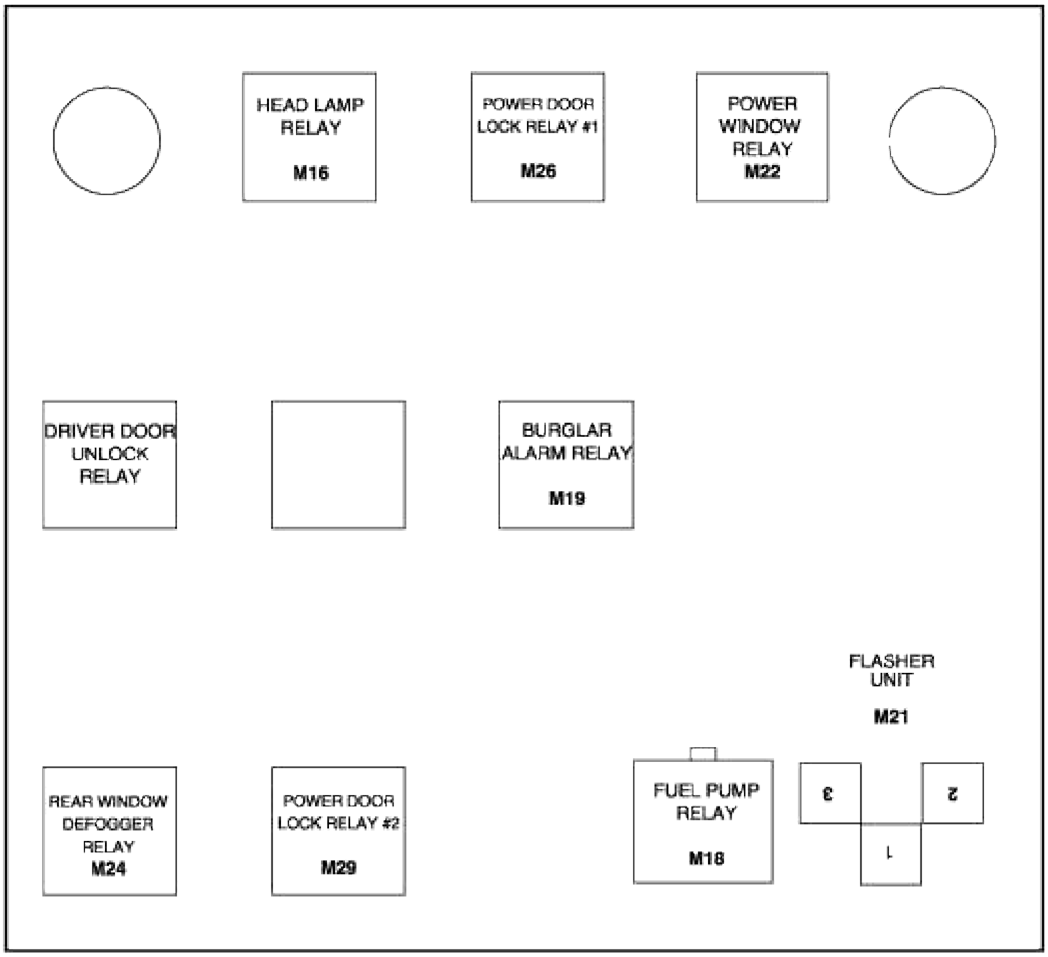
LAYOUT


FUSE BOX
1 10A
10 10A
2 10A
11 20A
3 10A
12 Not used
4 15A
13 10A
5 10A
14 10A
6 10A
15 15A
7 10A
16 10A
8 10A
17 10A
9 20A
18 20A
SPARE(10A)
SPARE(15A)
SPARE(20A)
DIODE Z01
DIODE Z02
4 3 2 1
8 7 6 5
12 11 10 9
16 15 14 13
JOINT CONNECTOR M31

CIRCUIT

FUSE	AMPERAGES	RELATED CIRCUIT
1	10A	Hazard Warning, Back-up Lamp Switch, A/T Shift & Key Lock Control Module
2	10A	ETACM, Generator Resistor, Instrument Cluster
3	10A	Instrument Cluster
4	15A	Air Bag
5	10A	ECM, TCM, A/T Shift Lever
6	10A	Power Door Lock
7	10A	Hazard Warning, ETACM
8	10A	Stop Lamp, A/T Shift Lever, A/T Key Interlock Solenoid
9	20A	Rear Window Defogger
10	10A	Head Lamp, Power Window, ETACM, Front Fog Lamp, Blower Control, Wiper
11	20A	Front Wiper & Washer
12		(Not used)
13	10A	ABS Control, ABS Bleeding
14	10A	Clock, Audio
15	15A	Cigarette Lighter
16	10A	Power Door Mirror Switch
17	10A	Power Door Mirror Motor & Defogger
18	20A	Rear Wiper

[PASSENGER COMPARTMENT RELAY BOX]


HEAD LAMP RELAY
M16
POWER DOOR LOCK RELAY #1
M26
POWER WINDOW RELAY
M22
DRIVER DOOR UNLOCK RELAY
BURGLAR ALARM RELAY
M19
FLASHER UNIT
M21
REAR WINDOW DEFOGGER RELAY
M24
POWER DOOR LOCK RELAY #2
M29
FUEL PUMP RELAY
M18
3
2
1

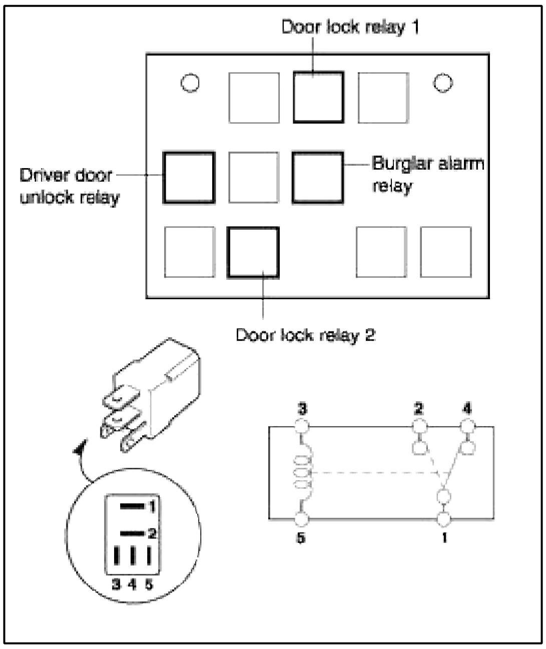
Body Electrical System > Fuses And Relays > Relay Box (Passenger Compartment) > Repair procedures

INSPECTION

POWER RELAY TEST (TYPE A)

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.5 terminals.

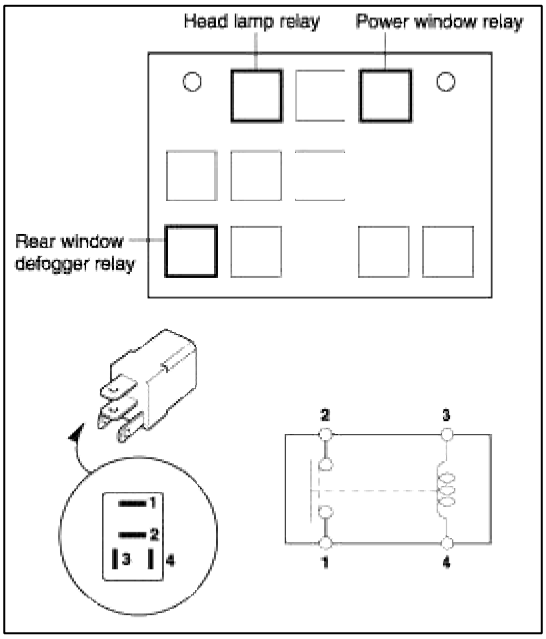
2. There should be continuity between the No.1 and No.4 terminals when power is disconnected.


Door lock relay 1
Driver door unlock relay
Burglar alarm relay
Door lock relay 2
1
2
3 4 5
3
2
4
5
1

Terminal / Position	3	5	1	2	4
Disconnected			○	─	○
Connected	⊖	⊕	○	○	

POWER RELAY TEST (TYPE B)

1. There should be continuity between the No.1 and No.2 terminals when power and ground are connected to the No.3 and No.4 terminals.
2. There should be no continuity between the No.1 and No.2 terminals when power is disconnected.


Head lamp relay
Power window relay
Rear window defogger relay
1
2
3
4
2
3
1
4

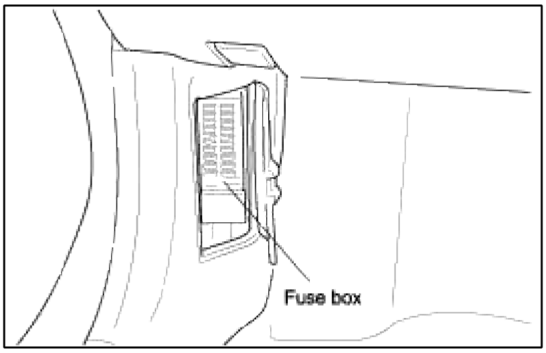
Terminal / Power (No.3-No.4)	1	2	3	4
Disconnected			○	○
Connected	○	○	⊖	⊕

FUSE INSPECTION

1. Be sure there is no play in the fuse holders, and that the fuses are held securely.
2. Are the fuse capacities for each circuit correct?

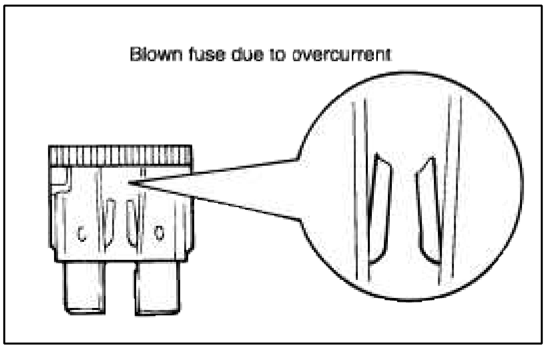
3. Are there any blown fuses?
   If a fuse is to be replaced, be sure to use a new fuse of the same capacity. Always determine why the fuse blew and completely eliminate the problem before installing a new fuse.

> **CAUTION**
>
> Never use a fuse of higher capacity than specified.

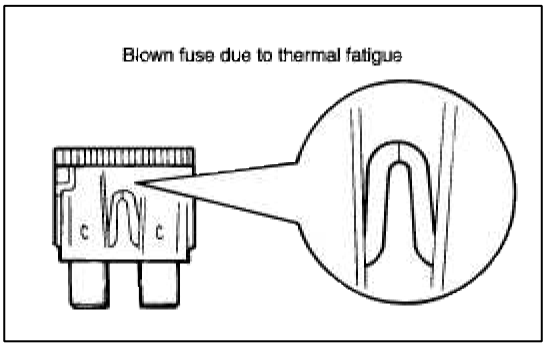


FUSES

1. **Fuse blown due to over-current.**
   Prior to replacing the fuse with a new one, check the circuit for a short and the related parts for abnormal conditions. Only after the correction of a short or replacement of abnormal parts, should a fuse with the same ampere rating be installed.

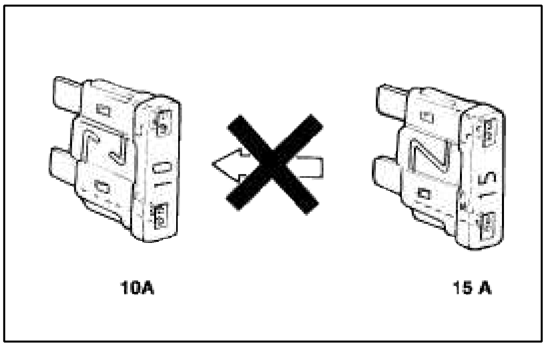


2. **Fuse blown due to repeated on-off current.**
   Normally, this type of problem occurs after a fairly long period of use, and is less frequent than #1 above. In this case, you may simply replace with a new fuse of the same capacity.



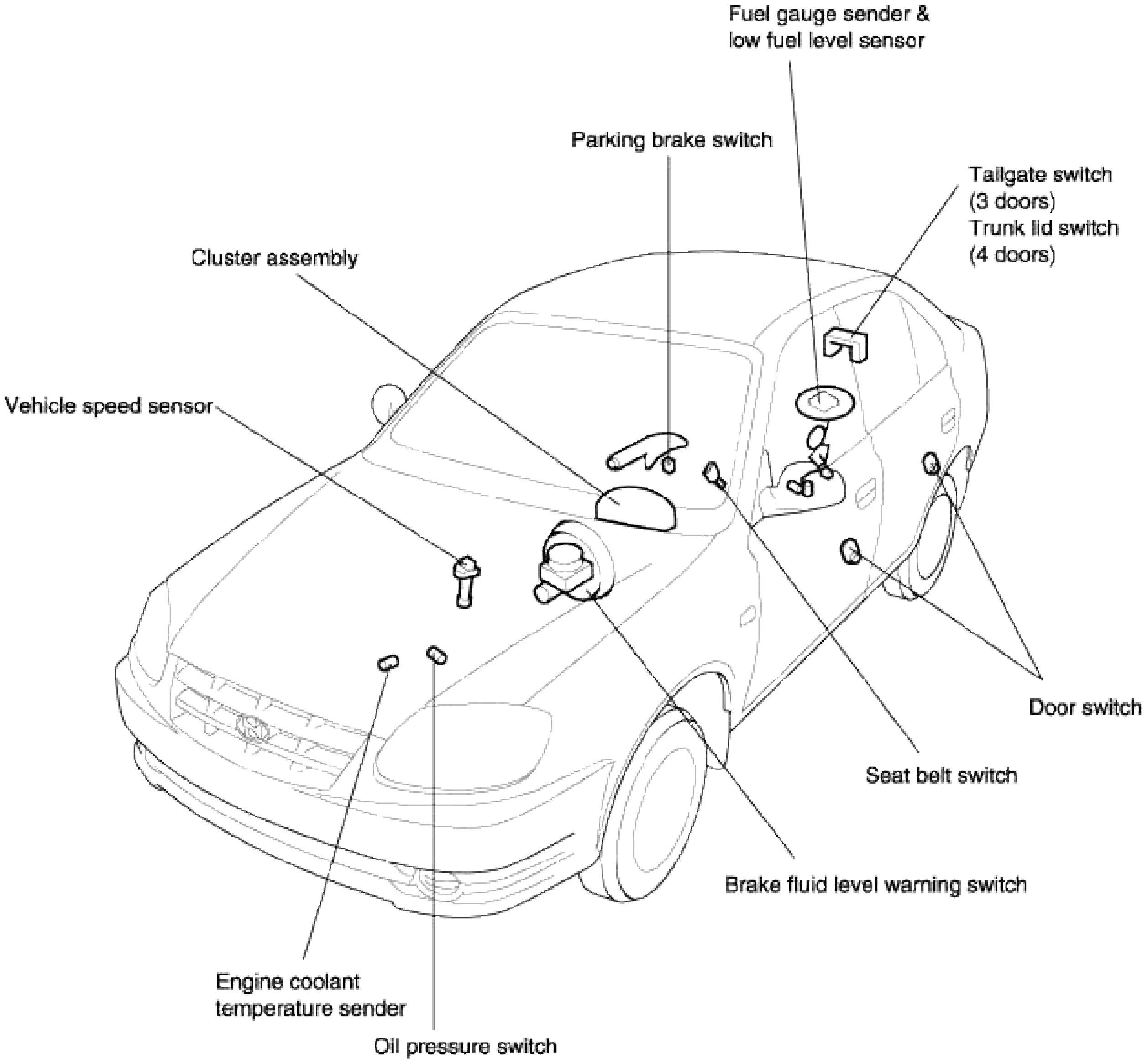
CAUTION

A blade type fuse is identified by the numbered value in amperes. If the fuse is blown, be sure to replace a fuse with the same ampere rating.If a fuse of higher capacity than specified is used, parts may be damaged and a danger of fire exists. To remove or insert a fuse, use the fuse puller in the fuse box.



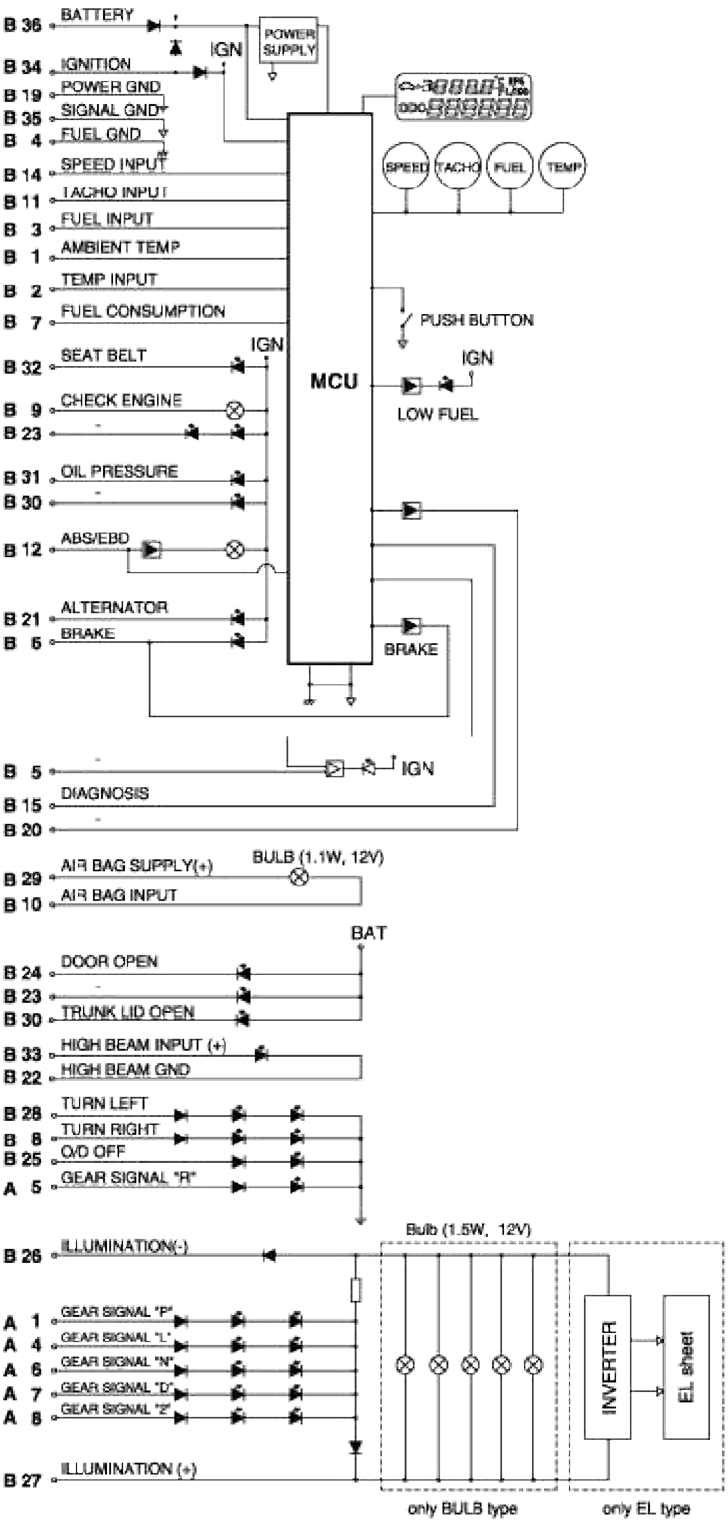
Body Electrical System > Indicators And Gauges > Components and Components Location

COMPONENTS


Fuel gauge sender &
low fuel level sensor
Parking brake switch
Tailgate switch
(3 doors)
Trunk lid switch
(4 doors)
Cluster assembly
Vehicle speed sensor
Door switch
Seat belt switch
Brake fluid level warning switch
Engine coolant
temperature sender
Oil pressure switch

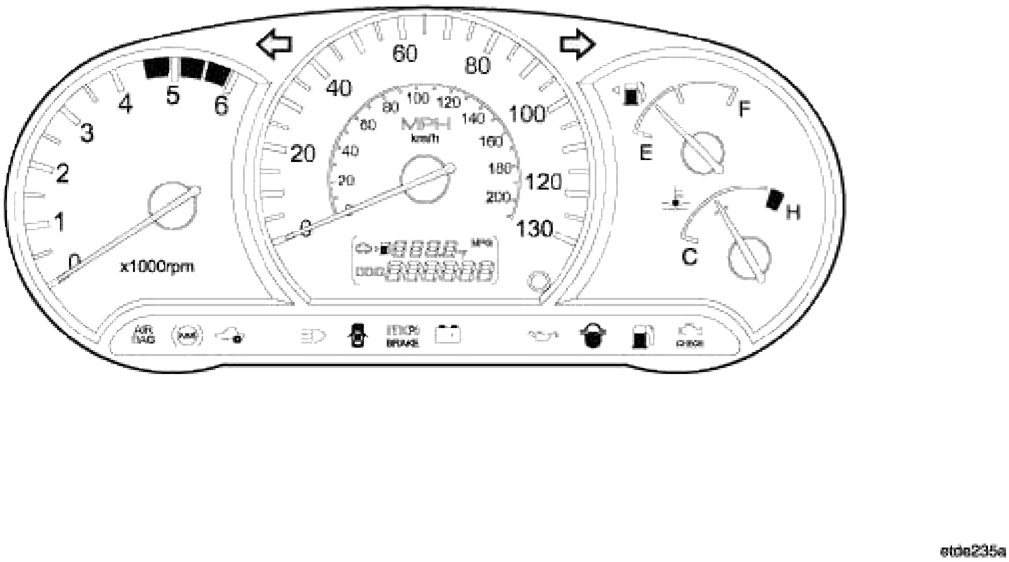
Body Electrical System > Indicators And Gauges > Instrument Cluster > Schematic Diagrams

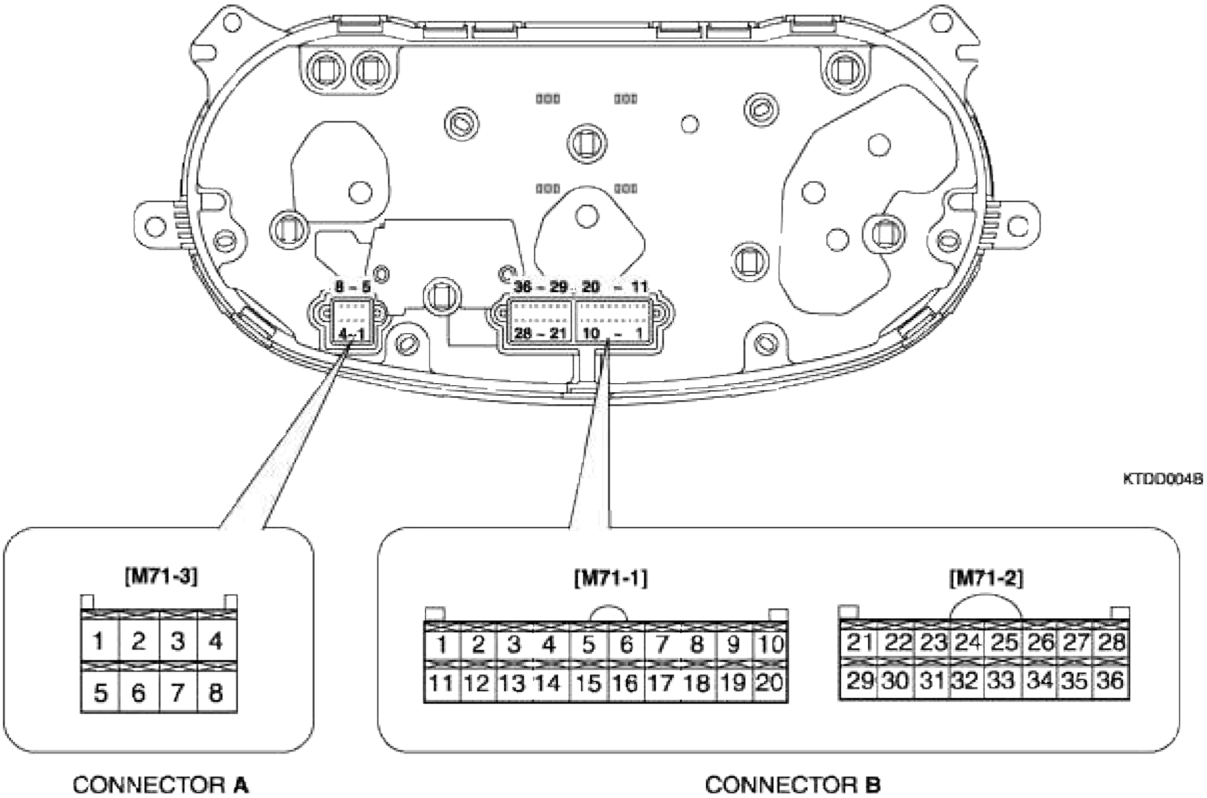
CIRCUIT DIAGRAM


B 36 BATTERY
B 34 IGNITION
B 19 POWER GND
B 35 SIGNAL GND
B 4 FUEL GND
B 14 SPEED INPUT
B 11 TACHO INPUT
B 3 FUEL INPUT
B 1 AMBIENT TEMP
B 2 TEMP INPUT
B 7 FUEL CONSUMPTION
B 32 SEAT BELT
B 9 CHECK ENGINE
B 23
B 31 OIL PRESSURE
B 30
B 12 ABS/EBD
B 21 ALTERNATOR
B 6 BRAKE
B 5
B 15 DIAGNOSIS
B 20
B 29 AIR BAG SUPPLY(+)
B 10 AIR BAG INPUT
BULB (1.1W, 12V)
BAT
B 24 DOOR OPEN
B 23
B 30 TRUNK LID OPEN
B 33 HIGH BEAM INPUT (+)
B 22 HIGH BEAM GND
B 28 TURN LEFT
B 8 TURN RIGHT
B 25 O/D OFF
A 5 GEAR SIGNAL "R"
B 26 ILLUMINATION(-)
A 1 GEAR SIGNAL "P"
A 4 GEAR SIGNAL "L"
A 6 GEAR SIGNAL "N"
A 7 GEAR SIGNAL "D"
A 8 GEAR SIGNAL "2"
B 27 ILLUMINATION (+)
IGN
POWER SUPPLY
ODO
SPEED
TACHO
FUEL
TEMP
PUSH BUTTON
MCU
LOW FUEL
BRAKE
Bulb (1.5W, 12V)
INVERTER
EL sheet
only BULB type
only EL type

Body Electrical System > Indicators And Gauges > Instrument Cluster > Components and Components Location

COMPONENTS


x1000rpm
0
1
2
3
4
5
6
MPH
km/h
0
20
40
60
80
100
120
130
E
F
C
H
AIR BAG
ABS
BRAKE
CHECK
etda235a

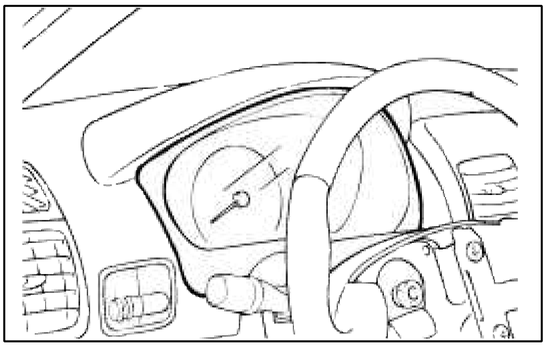

8 - 5
4 - 1
36 - 29
20 - 11
28 - 21
10 - 1
KTDD004B
[M71-3]
[M71-1]
[M71-2]
CONNECTOR A
CONNECTOR B

Body Electrical System > Indicators And Gauges > Instrument Cluster > Repair procedures

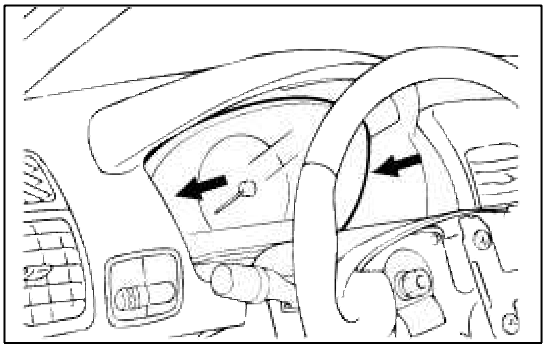
REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.

2. Remove the cluster facia panel.



3. Remove the cluster from the housing after removing screws.



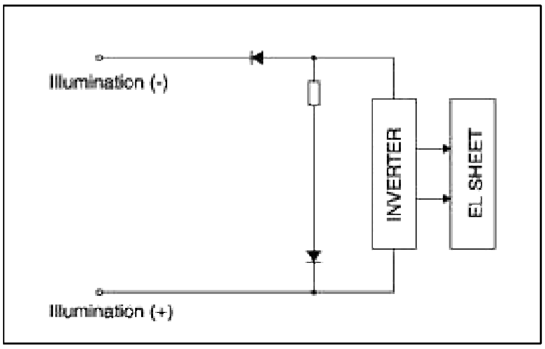
4. Disconnect the wire connectors from the cluster.
5. Installation is the reverse of removal.

INSPECTION

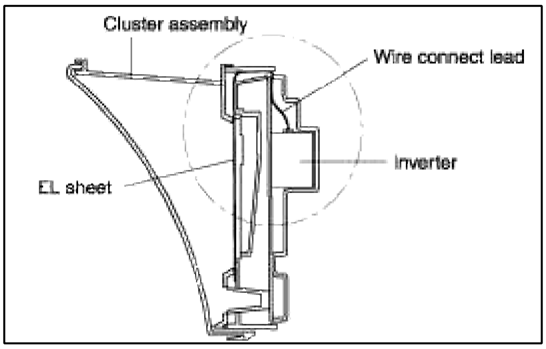
INVERTER (WITH EL TYPE CLUSTER)

The inverter is located in the instrument cluster and it converts the direct current (DC) into the alternating current (AC).

Illumination power applied to inverter in the cluster is converted into the alternating current (AC), which is supplied EL (Electroluminescent Lamp) sheets to be illuminated.

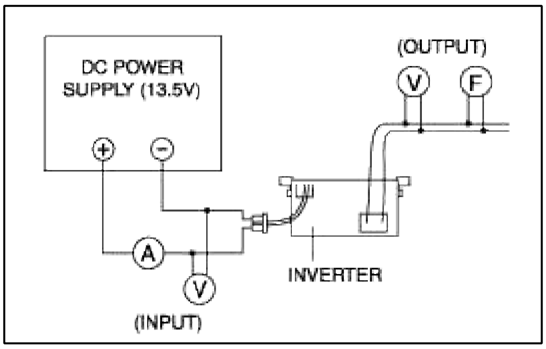

Illumination (-)
INVERTER
EL SHEET
Illumination (+)

1. Remove the front cover from the cluster and disconnect wire lead connector from EL sheet.


Cluster assembly
Wire connect lead
Inverter
EL sheet

2. Apply battery voltage (DC 13.5V) to the inverter in the cluster and measure the output voltage between terminal 1 and 2.

3. Also measure the output frequency between the terminals.

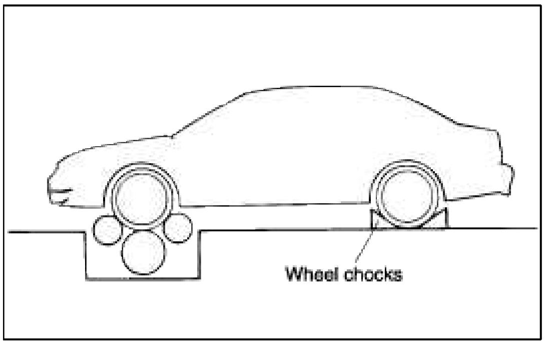


4. If the value is not as shown in the table, replace the inverter.

Input voltage	**Input current**	**Output voltage**	**Output frequency**	**EL sheet luminosity**
DC 13.5V ±1%	DC 30mA ±10%	40 Vrms ±20%	520Hz ±15%	11cd/m² ±8%

> NOTE
>
> If the inverter is normal, connect the EL and inverter, supply power to the cluster, and check the EL illuminates at the dark.
> If EL illumination is too dark, should be replaced.

SPEEDOMETER



1. Adjust the pressure of the tires to the specified level.
2. Drive the vehicle onto a speedometer tester. Use wheel chocks as appropriate.
3. Check if the speedometer indicator range is within the standard values.

> CAUTION
>
> Do not operate the clutch suddenly or increase/ decrease speed rapidly while testing.

> NOTE
>
> Tire wear and tire over or under inflation will increase the indication error.

Velocity (km/h)	20	40	60	80	100	120
Tolerance (km/h)	±2.4	±2.4	±2.4	±2.7	±2.7	±3.2
Velocity (km/h)	140	160	180	200	Area	
Tolerance (km/h)	±3.2	±3.7	±3.7	±4.0	Only CANADA	

Velocity (MPH)	10	20	40	60	80	100	120	Area
Tolerance (MPH)	±1.5	±1.5	±1.5	±1.7	±1.7	±1.7	±1.7	Only U.S.A

TACHOMETER

1. Connect the scan tool to the diagnostic link connector or install a tachometer.
2. With the engine started, compare the readings of the tester with that of the tachometer. Replace the tachometer if the tolerance is exceeded.

CAUTION

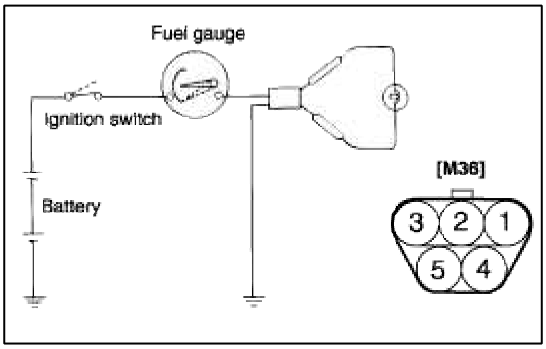
1. Reversing the connections of the tachometer will damage the transistor and diodes inside.
2. When removing or installing the tachometer, be careful not to drop it or subject it to severe shock.

Revolution (RPM)	1,000	2,000	3,000	4,000	5,000	6,000	7,000
Tolerance (RPM)	±100	±125	±150	±170	±200	±240	±280

FUEL GAUGE

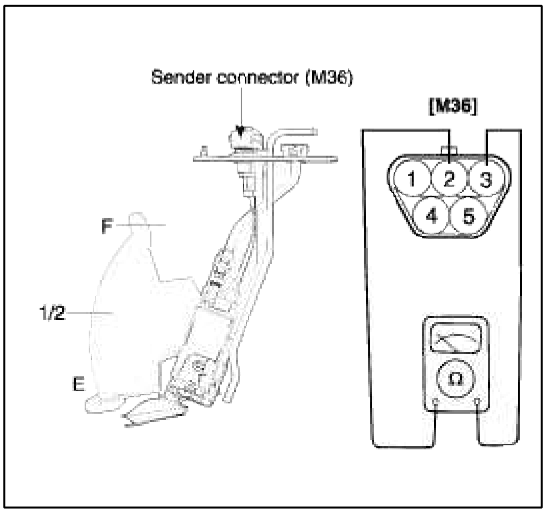
OPERATION CHECK

1. Disconnect the fuel sender connector from the fuel sender.
2. Connect a 3.4 watt, 12V test bulb to terminals 2 and 3 on the wire harness side connector.
3. Turn the ignition switch to the ON, and then check that the bulb lights up and the fuel gauge needle moves to full.



FUEL SENDER

1. Using an ohmmeter, measure the resistance between terminals 2 and 3 at each float level.



2. Also check that the resistance changes smoothly when the float is moved from "E" to "F".

Position	Gauge angle (°)	Resistance (Ω)
Sender (E)	-4.5 ± 4.0	200
Gauge (E)	0 ± 4.0	184
Warning lamp	4.2 ± 4.0	170
1/2	50 ± 4.0	66
Gauge (F)	100 ± 4.0	15
Sender (F)	104.5 ± 4.0	8

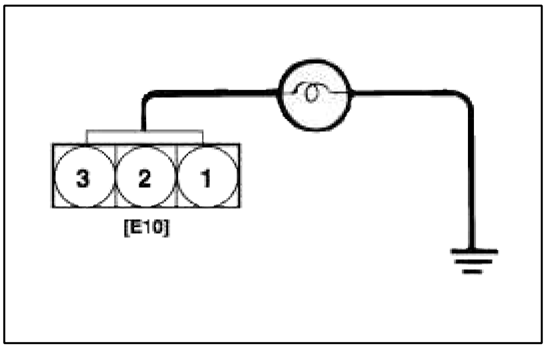
3. If the resistance is unsatisfied, replace the fuel sender as an assembly.

CAUTION

After completing this test, wipe the sender dry and reinstall it in the fuel tank.

ENGINE COOLANT TEMPERATURE GAUGE

1. Disconnect the wiring connector from the engine coolant temperature sender in the engine compartment.
2. Turn the ignition switch ON. Check that the gauge needle indicates cool. Turn the ignition switch OFF.
3. Connect a 12V, 3.4 watt test bulb between the harness side connector and ground.

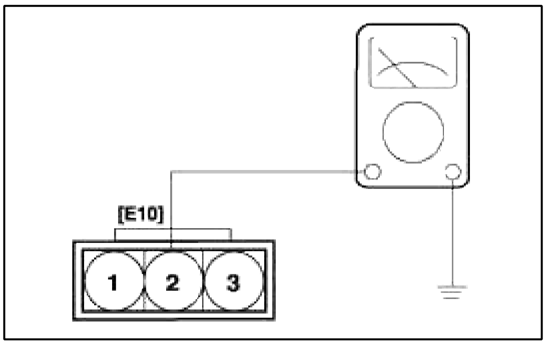


4. Turn the ignition switch ON.
5. Verify that the test bulb flashes and that the indicator moves to HOT.

If operation is not as specified, replace the engine coolant temperature gauge. Then recheck the system.

ENGINE COOLANT TEMPERATURE SENDER

1. Using an ohmmeter, measure the resistance between the terminal 2 and ground.

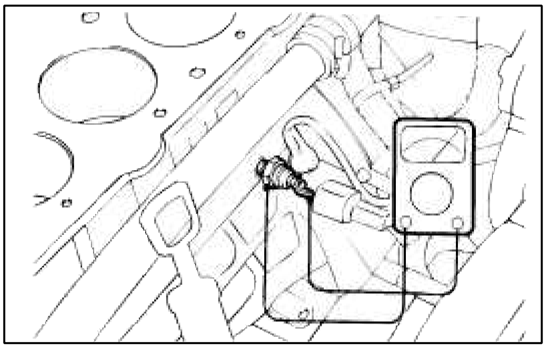


2. If the resistance value is not as shown in the table, replace the temperature sender.

Temperature (°C)	55	85	110	125
Gauge angle (°)	0	43 ± 4	43 ± 4	95 ± 4
Resistance (Ω)	160.3	70.3	27.9	18.6

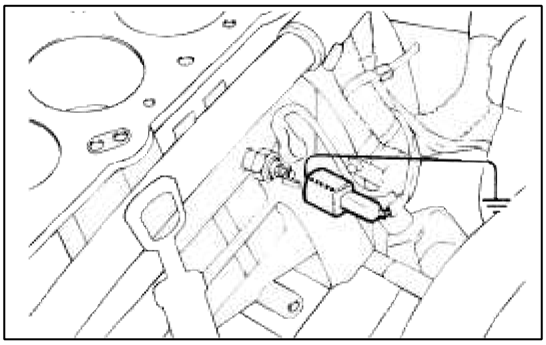
OIL PRESSURE SWITCH

1. Check that there is continuity between the terminal and ground with the engine off.
2. Check that there is no continuity between the terminal and ground with the engine running.
3. If operation is not as specified, replace the switch.



OIL PRESSURE WARNING LAMP

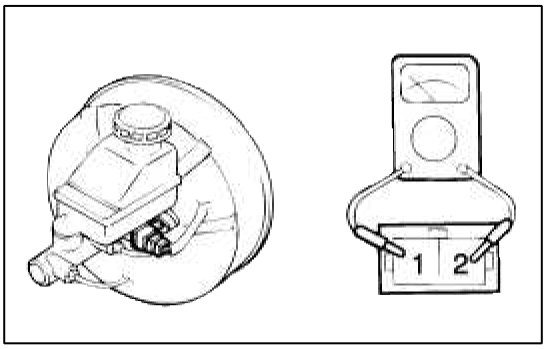
1. Disconnect the connector from the warning switch and ground the terminal on the wire harness side connector.
2. Turn the ignition switch ON. Check that the warning lamp lights up.If the warning lamp doesn't light, test the bulb or inspect the wire harness.



BRAKE FLUID LEVEL WARNING SWITCH

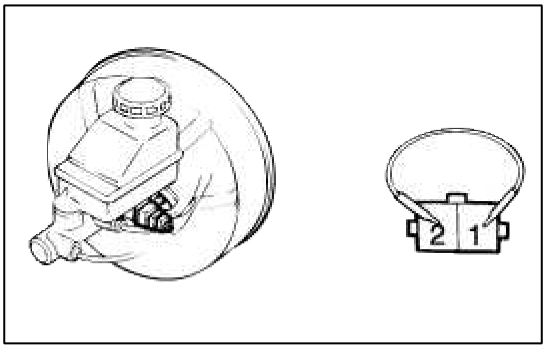
1. Remove the connector from the switch located at the brake fluid reservoir.

2. Verify that continuity exists between switch terminals 1 and 2 while pressing the switch (float) down with a rod.



BRAKE FLUID LEVEL WARNING LAMP

1. Start the engine.
2. Release the parking brake.
3. Remove the connector from the brake fluid level warning switch.
4. Ground the connector at the harness side.
5. Verify that the warning lamp lights.

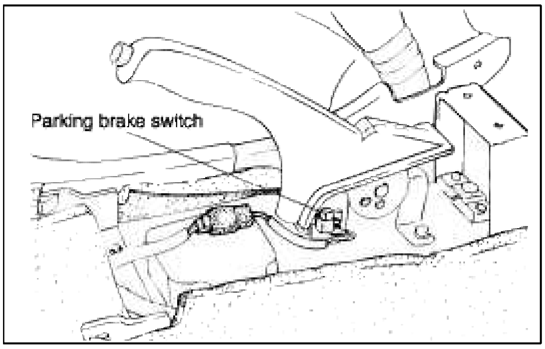


PARKING BRAKE SWITCH

The parking brake switch is a push type located under the parking brake lever. To adjust, move the switch mount up and down with the parking brake lever released all the way.

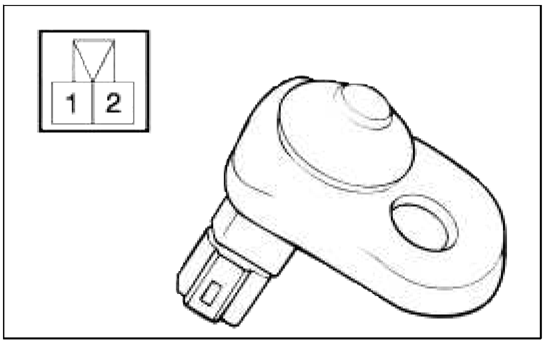
1. Check that there is continuity between the terminal and switch body with the switch ON (Lever is pulled).
2. Check that there is no continuity between the terminal and switch bodywith the switch OFF (Lever is released).

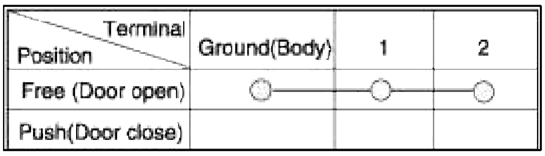
If continuity is not as specified, replace the switch or inspect its ground connection.



DOOR SWITCH

Remove the door switch and check for continuity between the terminals.



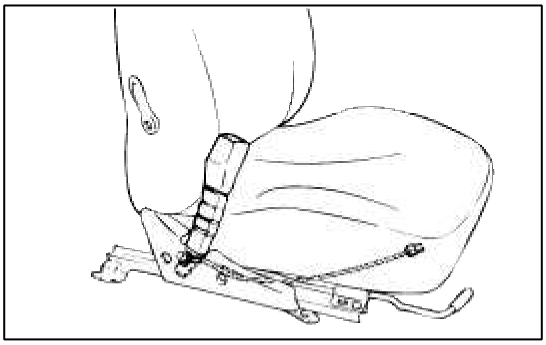


Terminal / Position	Ground(Body)	1	2
Free (Door open)	○	○	○
Push(Door close)			

SEAT BELT SWITCH

1. Remove the connector from the switch.
2. Check for continuity between terminals.

Seat belt condition	Continuity
Fastened	Non-conductive (∞Ω)
Not fastened	Conductive (Ω)



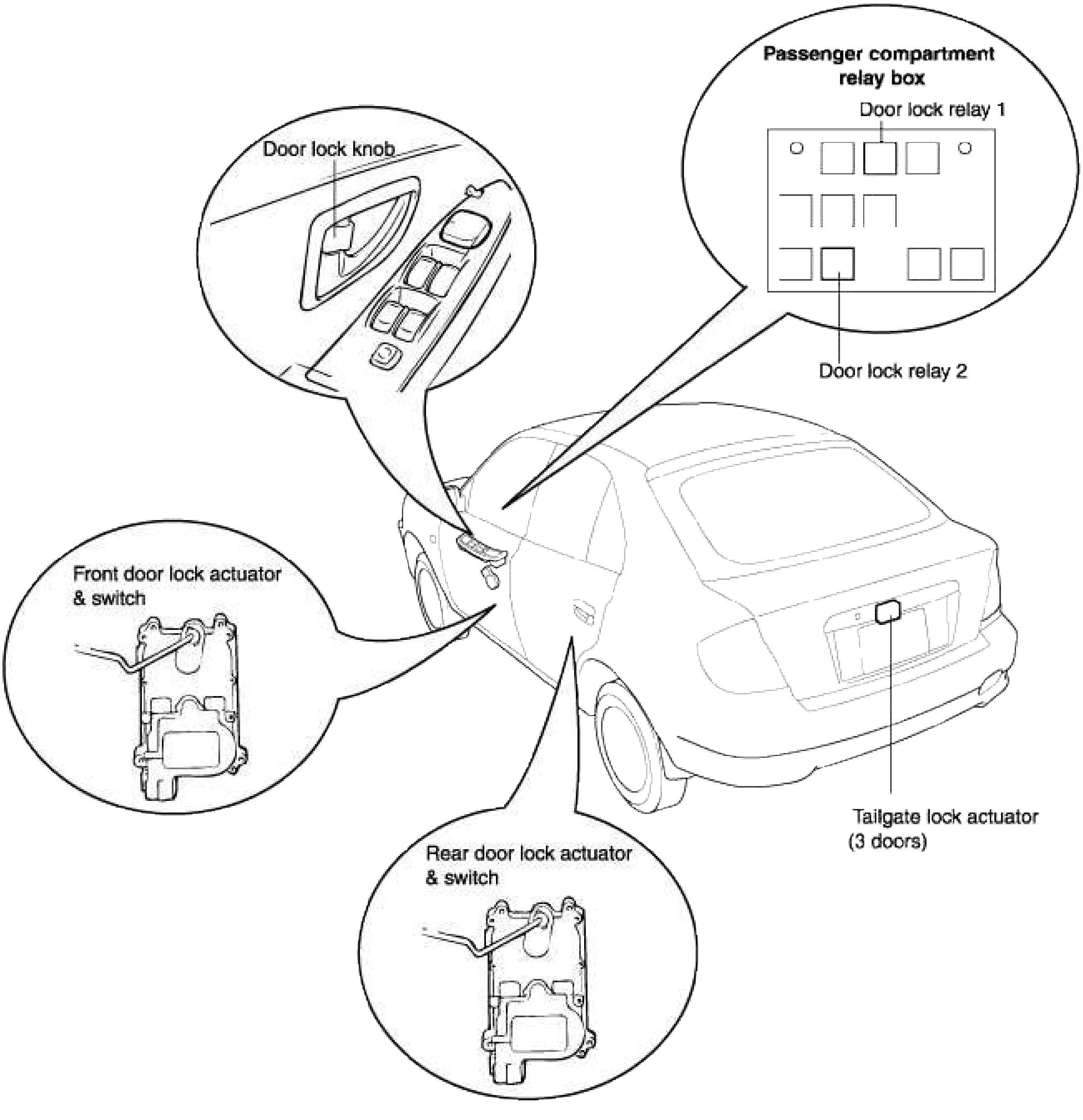
SEAT BELT WARNING LAMP

With the ignition switch turned ON, verify that the lamp glows.

Seat belt condition	Warning lamp
Fastened	OFF
Not fastened	ON

Body Electrical System > Power Door Locks > Components and Components Location

COMPONENTS


Passenger compartment relay box
Door lock relay 1
Door lock relay 2
Door lock knob
Front door lock actuator & switch
Rear door lock actuator & switch
Tailgate lock actuator (3 doors)

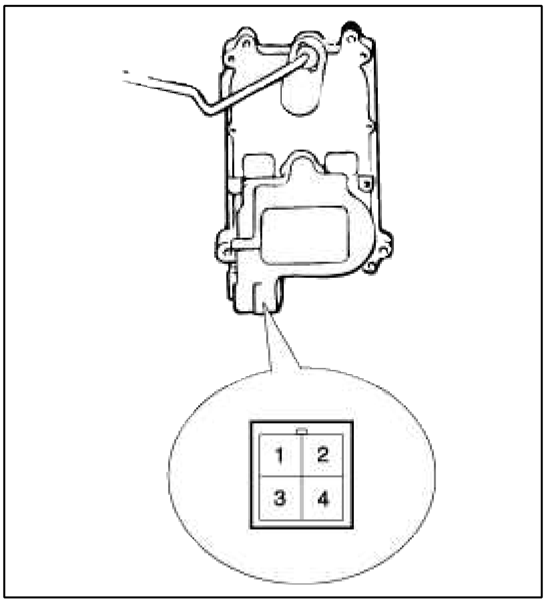
Body Electrical System > Power Door Locks > Power Door Lock Actuators > Repair procedures

INSPECTION

FRONT DOOR LOCK ACTUATOR INSPECTION

1. Remove the front door trim panel. (see BD group-front door)

2. Disconnect the 4P connector from the actuator.

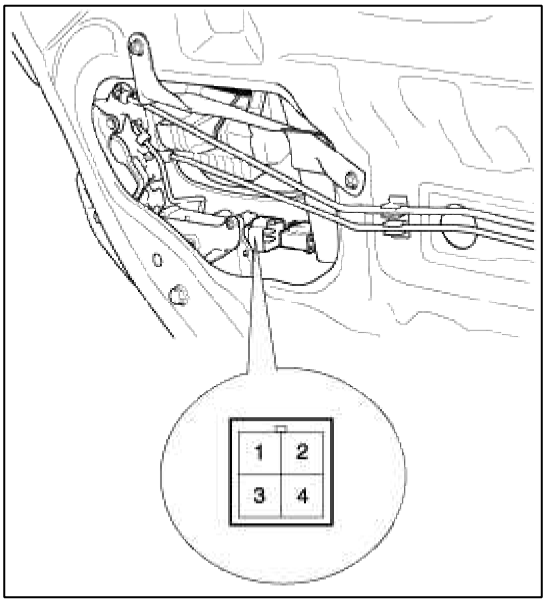


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		2	4
Front left	Lock	⊕	⊖
	Unlock	⊖	⊕
Front right	Lock	⊖	⊕
	Unlock	⊕	⊖

REAR DOOR LOCK ACTUATOR INSPECTION

1. Remove the rear door trim panel. (see BD group-rear door)
2. Disconnect the 4P connector from the actuator.

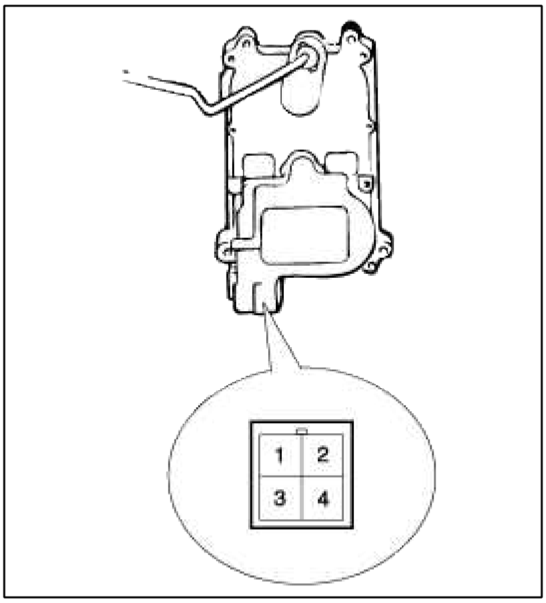


3. Check actuator operation by connecting power and ground according to the table. To prevent damage to the actuator, apply battery voltage only momentarily.

Position \ Terminal		2	4
Rear left	Lock	⊖	⊕
	Unlock	⊕	⊖
Rear right	Lock	⊕	⊖
	Unlock	⊖	⊕

FRONT DOOR LOCK SWITCH INSPECTION

1. Remove the front door trim panel. (see BD group-front door)
2. Disconnect the 4P connector from the actuator.

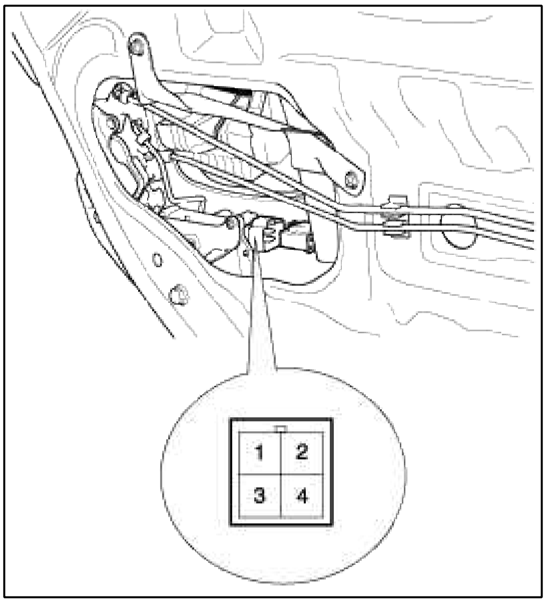


3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	3
Front left	Lock		
	Unlock	○	○
Front right	Lock		
	Unlock	○	○

REAR DOOR LOCK SWITCH INSPECTION

1. Remove the rear door trim panel. (see BD group-rear door)
2. Disconnect the 4P connector from the actuator.



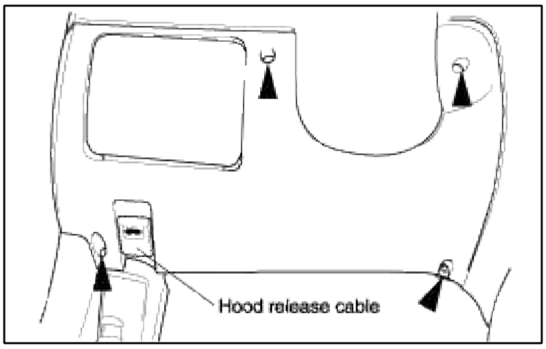
3. Check for continuity between the terminals in each switch position according to the table.

Position \ Terminal		1	3
Rear left	Lock		
	Unlock	○	○
Rear right	Lock		
	Unlock	○	○

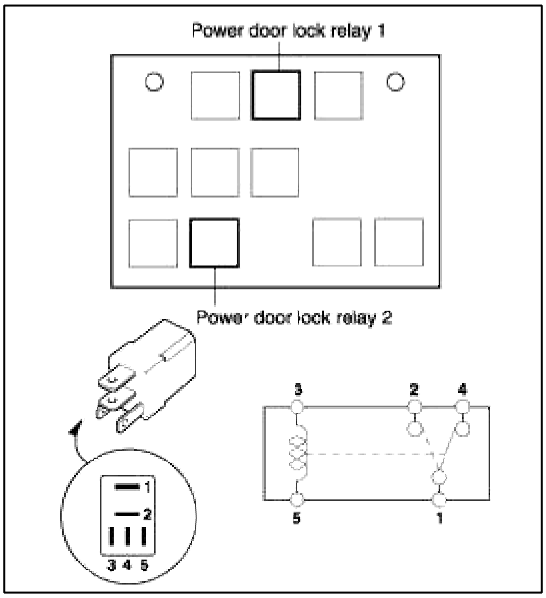
Body Electrical System > Power Door Locks > Power Door Lock Relay > Repair procedures

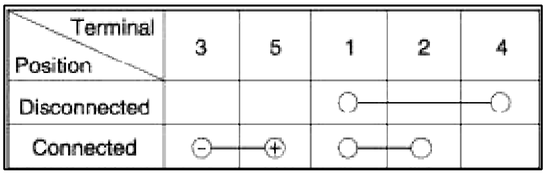
INSPECTION

1. Remove the negative(-) battery terminal.
2. Remove the driver's side crash pad lower panel. (see BD group - crash pad)


Hood release cable

3. Remove the door lock relay in the passenger compartment relay box, then check for continuity between the terminals.

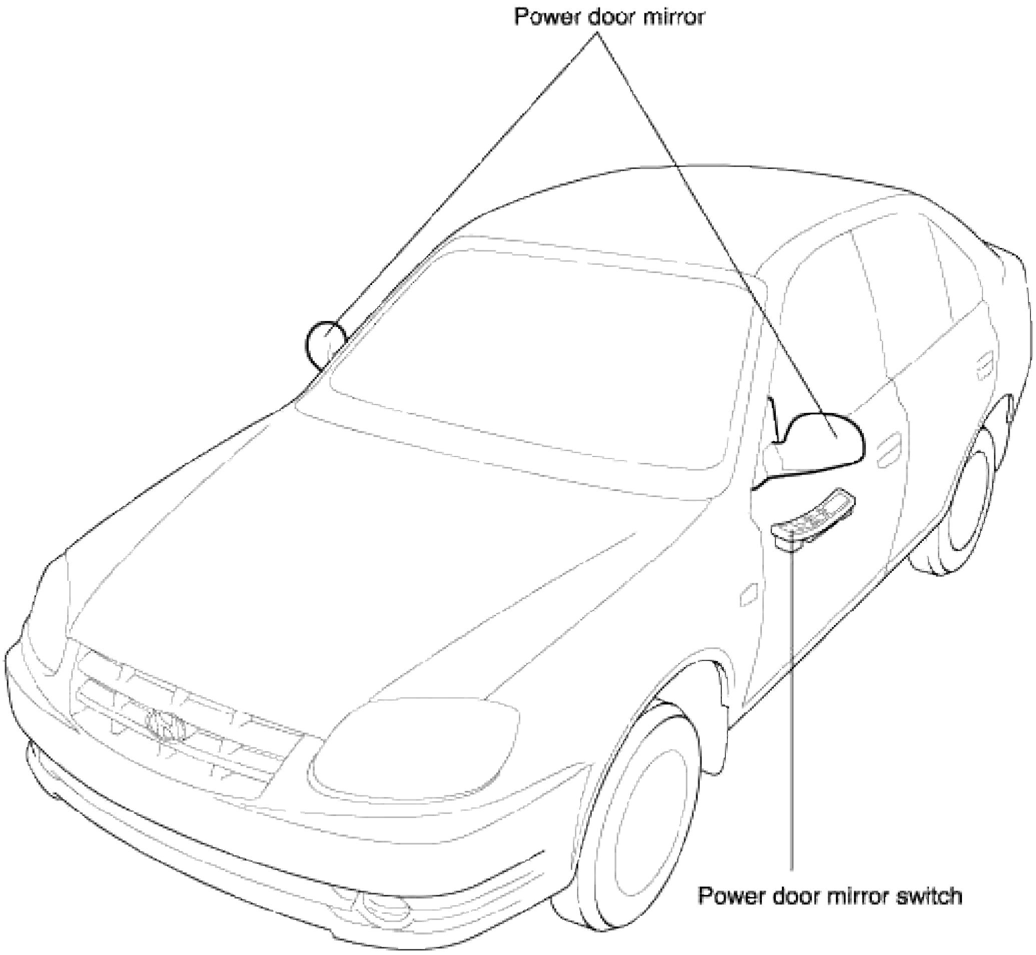

Power door lock relay 1
Power door lock relay 2
1
2
3 4 5
3
2
4
5
1



Terminal / Position	3	5	1	2	4
Disconnected			○	—	○
Connected	⊖	⊕	○	○	

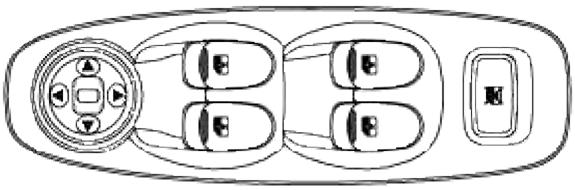
Body Electrical System > Power Door Mirrors > Components and Components Location

COMPONENTS

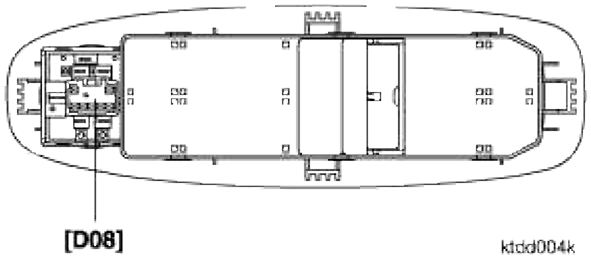

Power door mirror
Power door mirror switch

Body Electrical System > Power Door Mirrors > Power out side mirror switch > Schematic Diagrams

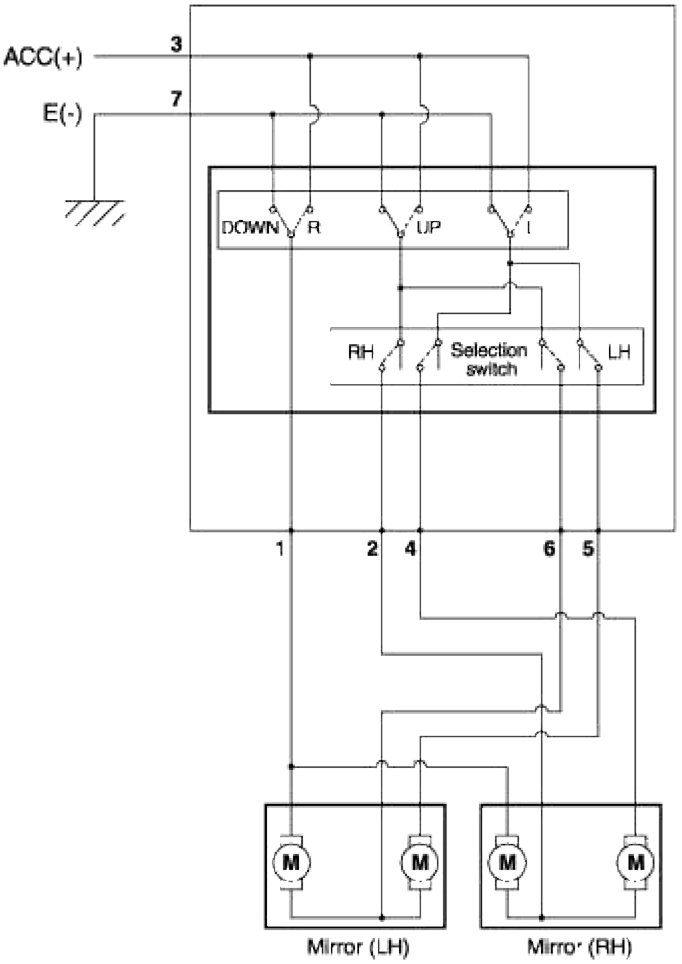
CIRCUIT DIAGRAM

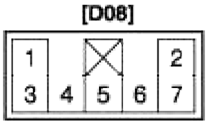


ktdd004j



ktdd004k


ACC(+)
3
E(-)
7
DOWN
R
UP
L
RH
Selection switch
LH
1
2
4
6
5
M
M
M
M
Mirror (LH)
Mirror (RH)

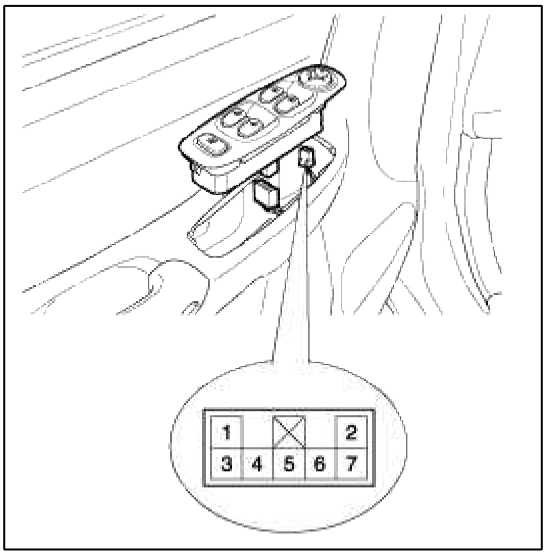

[D08]
1
2
3
4
5
6
7

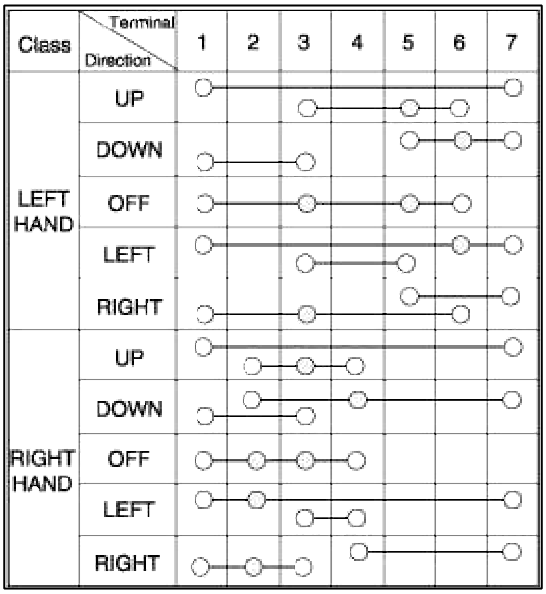
Body Electrical System > Power Door Mirrors > Power out side mirror switch > Repair procedures

INSPECTION

1. Remove the power door mirror switch from the door trim panel.

2. Check for continuity between the terminals in each switch position according to the table.





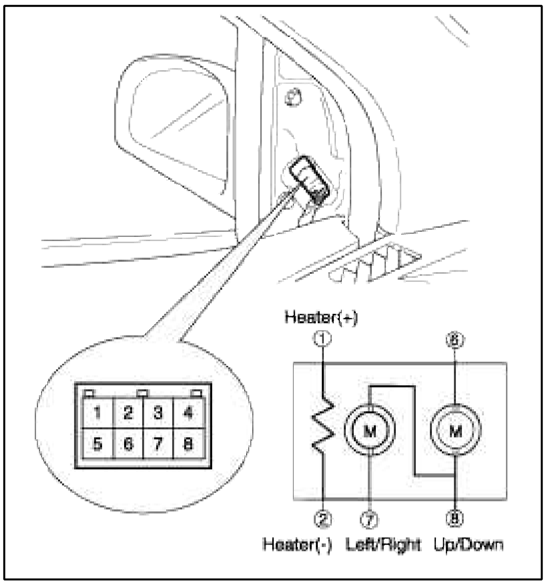
Class	Terminal / Direction	1	2	3	4	5	6	7
LEFT HAND	UP	○	—	—	—	—	—	○
				○	—	○	○	
	DOWN					○	○	○
		○	—	○				
	OFF	○	—	○	—	○	○	
	LEFT	○	—	—	—	—	○	○
				○	—	○		
	RIGHT					○	—	○
		○	—	○	—	—	○	
RIGHT HAND	UP	○	—	—	—	—	—	○
			○	○	○			
	DOWN		○	—	○	—	—	○
		○	—	○				
	OFF	○	○	○	○			
	LEFT	○	○	—	—	—	—	○
				○	○			
	RIGHT				○	—	—	○
		○	○	○				

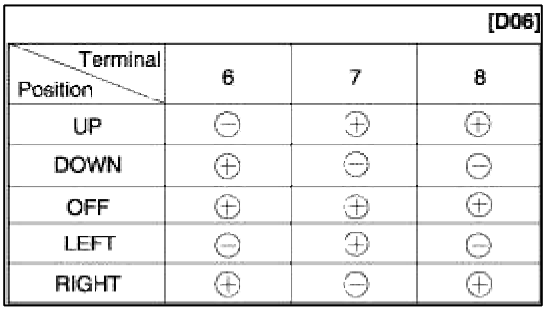
Body Electrical System > Power Door Mirrors > Power Door Mirror Actuator > Repair procedures

INSPECTION

1. Disconnect the power door mirror connector from the harness.

2. Apply battery voltage to each terminal as shown in the table and verify that the mirror operates properly.

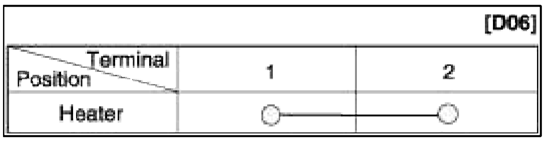

1 2 3 4
5 6 7 8
Heater(+)
①
⑥
M
M
②
⑦
⑧
Heater(-)
Left/Right
Up/Down



[D06]

Terminal / Position	6	7	8
UP	⊖	⊕	⊕
DOWN	⊕	⊖	⊖
OFF	⊕	⊕	⊕
LEFT	⊖	⊕	⊖
RIGHT	⊕	⊖	⊕

MIRROR HEATER INSPECTION

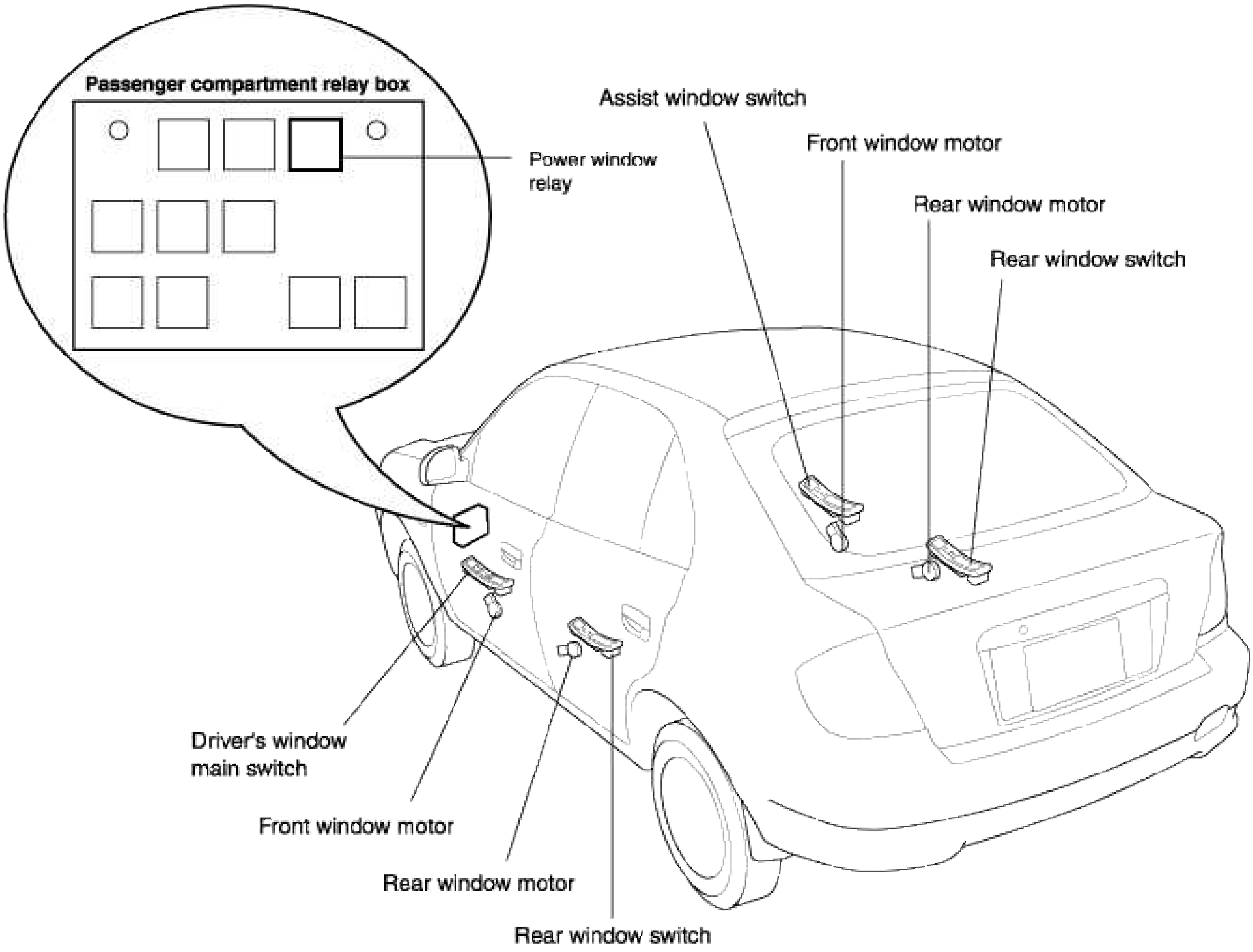


[D06]

Terminal / Position	1	2
Heater	○—	—○

Body Electrical System > Power Windows > Components and Components Location

COMPONENTS


Passenger compartment relay box
Power window relay
Assist window switch
Front window motor
Rear window motor
Rear window switch
Driver's window main switch
Front window motor
Rear window motor
Rear window switch

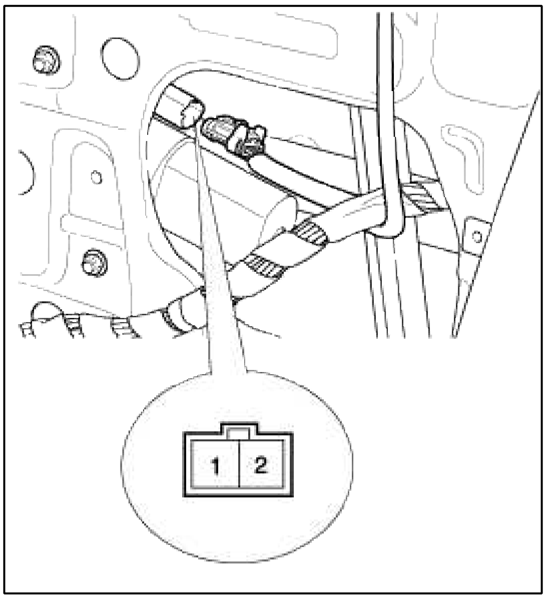
Body Electrical System > Power Windows > Power Window Motor > Repair procedures

INSPECTION

FRONT POWER WINDOW MOTOR INSPECTION

1. Remove the front door trim panel. (see BD group-front door)

2. Disconnect the 2P connector from the motor.

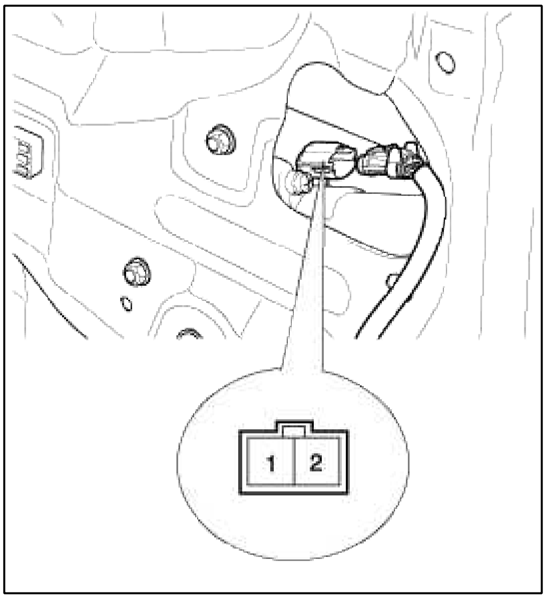


3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

Terminal / Direction	1	2
UP (Clockwise)	⊕	⊖
DOWN (Counter-clockwise)	⊖	⊕

REAR POWER WINDOW MOTOR INSPECTION

1. Remove the rear door trim panel. (see BD group-rear door)
2. Disconnect the 2P connector from the motor.

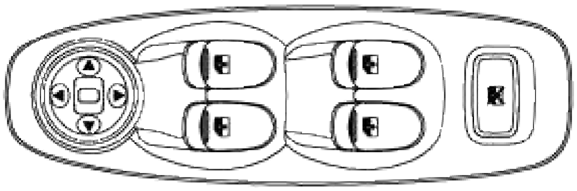


3. Connect the motor terminals directly to battery voltage (12V) and check that the motor operates smoothly. Next, reverse the polarity and check that the motor operates smoothly in the reverse direction. If the operation is abnormal, replace the motor.

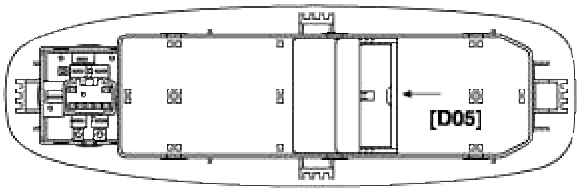
Terminal / Direction	1	2
UP (Clockwise)	⊕	⊖
DOWN (Counter-clockwise)	⊖	⊕

CIRCUIT DIAGRAM

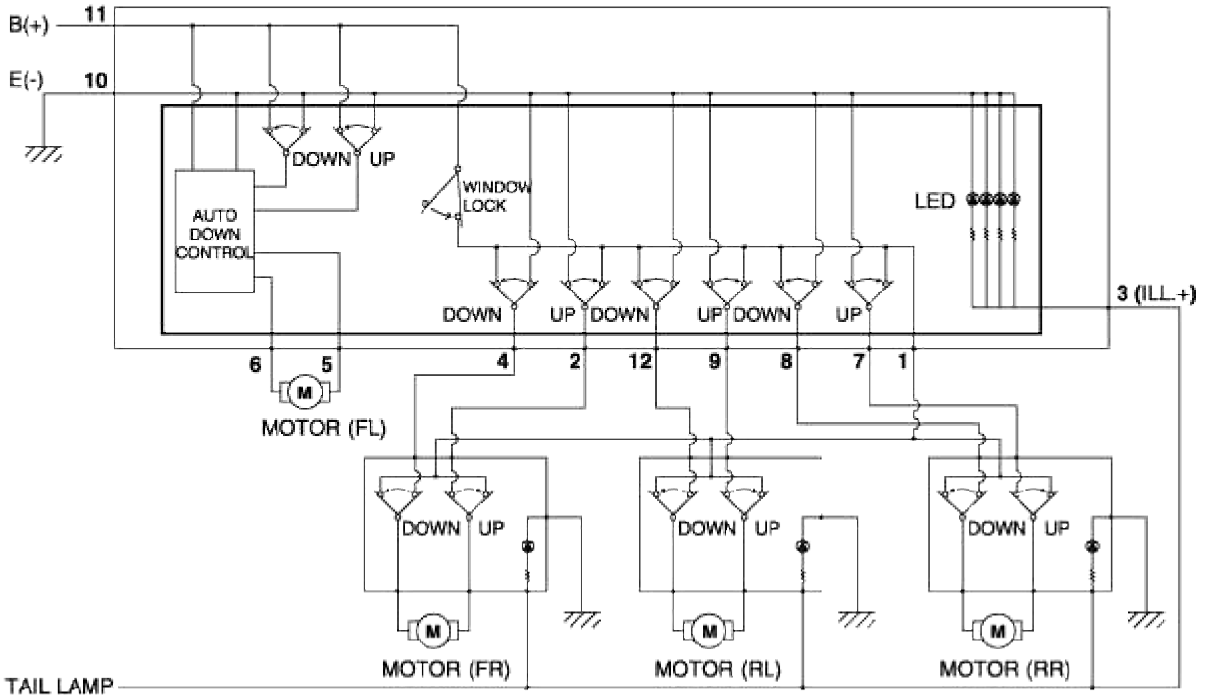
[POWER WINDOW MAIN SWITCH]



ktdd004j



ktdd004k

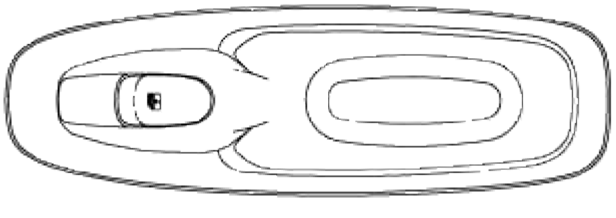

B(+)
11
E(-)
10
DOWN
UP
AUTO DOWN CONTROL
WINDOW LOCK
LED
DOWN
UP
DOWN
UP
DOWN
UP
3 (ILL.+)
6
5
4
2
12
9
8
7
1
MOTOR (FL)
DOWN
UP
DOWN
UP
DOWN
UP
MOTOR (FR)
MOTOR (RL)
MOTOR (RR)
TAIL LAMP

KTDD004L

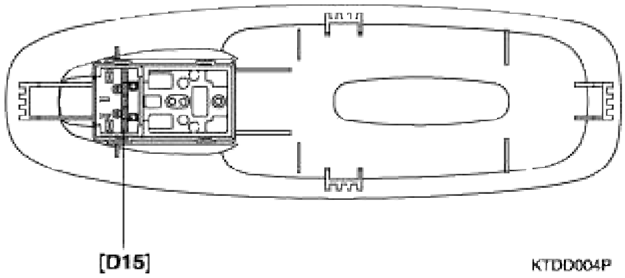
[D05]

1	2	3			4	5	6
7	8	9	10	11	12	13	14

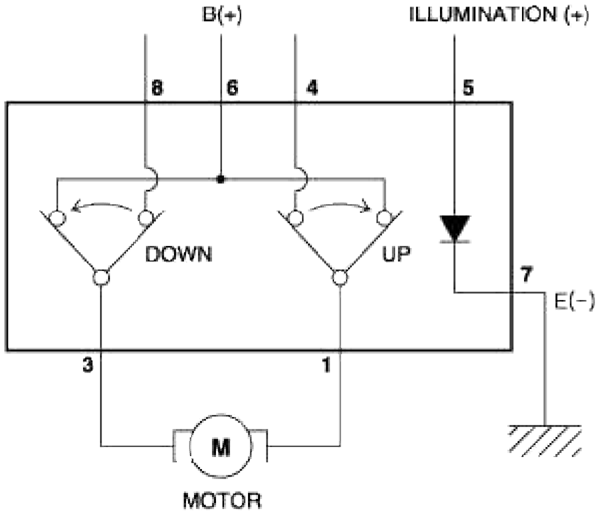
[POWER WINDOW SUB SWITCH]



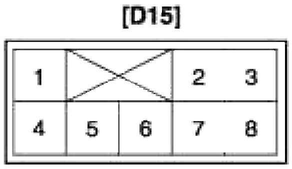
KTDD004N



KTDD004P


B(+)
ILLUMINATION (+)
8
6
4
5
DOWN
UP
7
E(-)
3
1
M
MOTOR

KTDD004Q

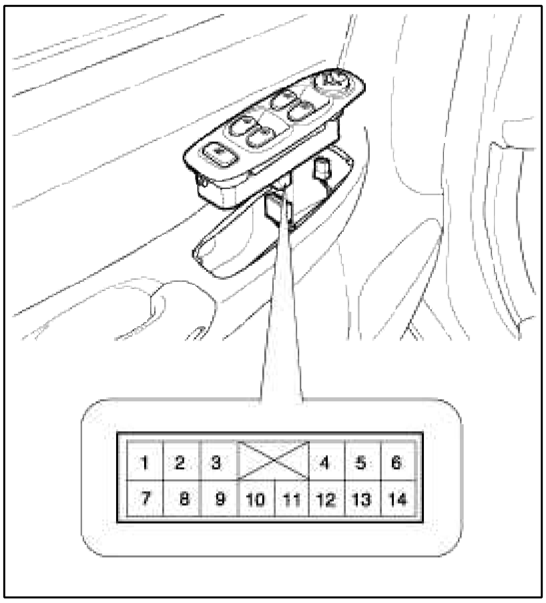

[D15]
1
2
3
4
5
6
7
8

Body Electrical System > Power Windows > Power Window Switch > Repair procedures

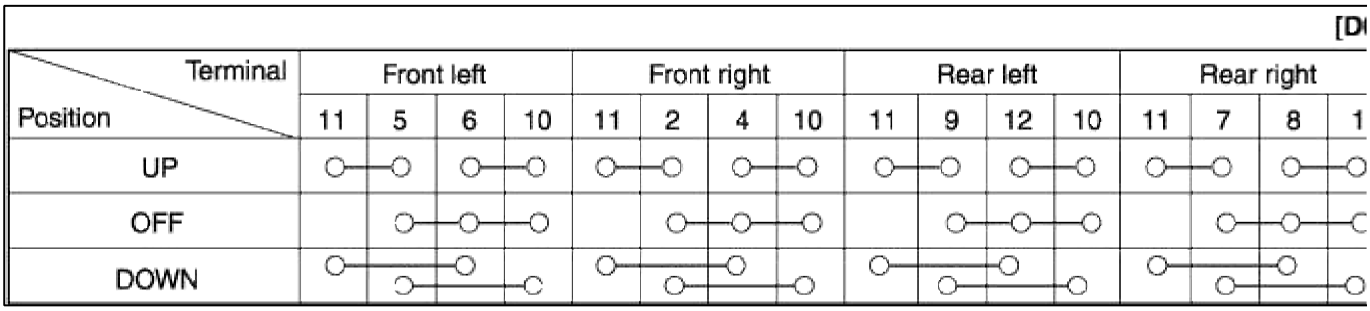
INSPECTION

POWER WINDOW MAIN SWITCH

1. Remove the power window main switch from the driver's door trim panel.



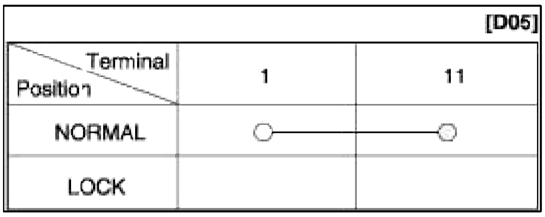
2. Check for continuity between the terminals.



[D

Position \ Terminal	Front left				Front right				Rear left				Rear right			
	11	5	6	10	11	2	4	10	11	9	12	10	11	7	8	1
UP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
OFF		○	○	○		○	○	○		○	○	○		○	○	○
DOWN	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

POWER WINDOW LOCK SWITCH

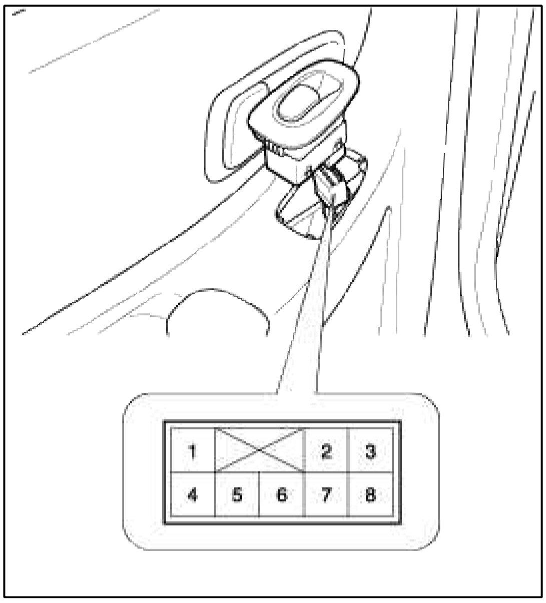


[D05]

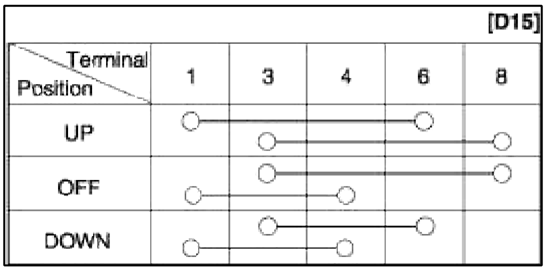
Position \ Terminal	1	11
NORMAL	○	○
LOCK		

POWER WINDOW SUB SWITCH

1. Remove the power window sub switch from the rear door trim panel.



2. Check for continuity between the terminals.
   If continuity is not as specified in the table, replace the power window switch.

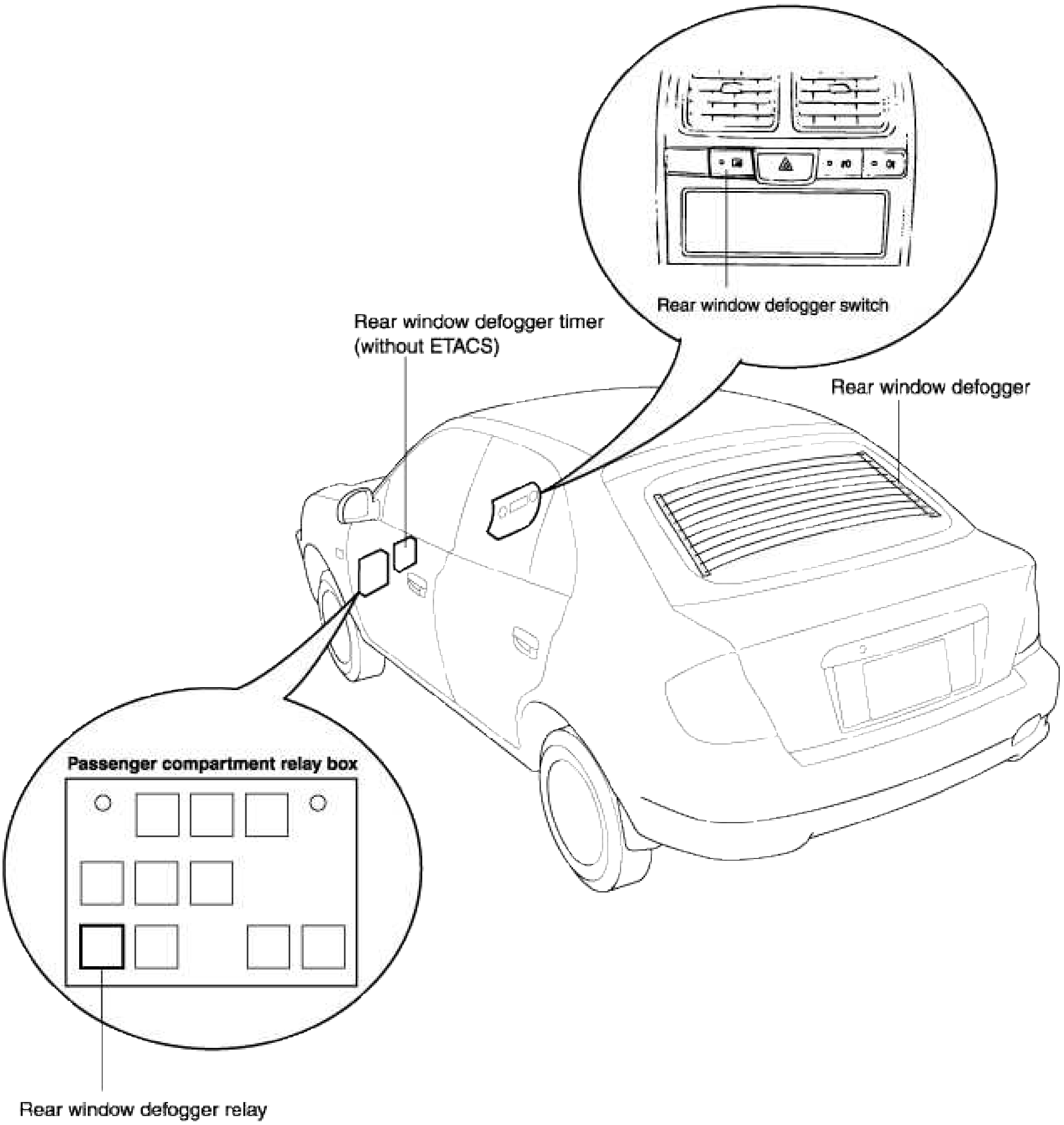


[D15]

Position \ Terminal	1	3	4	6	8
UP	○			○	
		○			○
OFF		○			○
	○		○		
DOWN		○		○	
	○		○		

Body Electrical System > Rear Window Defogger > Components and Components Location

COMPONENTS

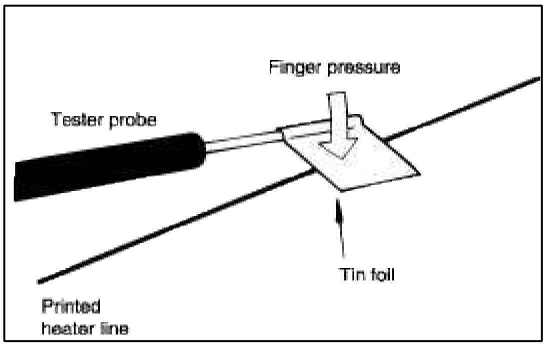

Rear window defogger switch
Rear window defogger timer
(without ETACS)
Rear window defogger
Passenger compartment relay box
Rear window defogger relay

Body Electrical System > Rear Window Defogger > Rear Window Defogger Printed Heater > Repair procedures

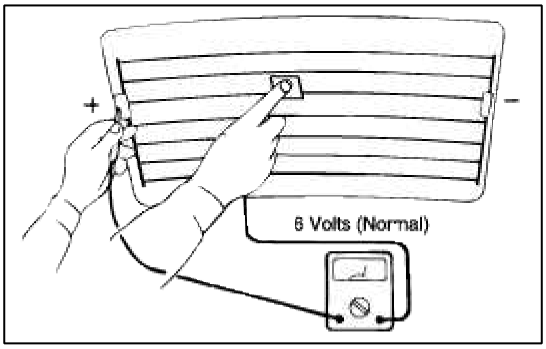
INSPECTION

CAUTION

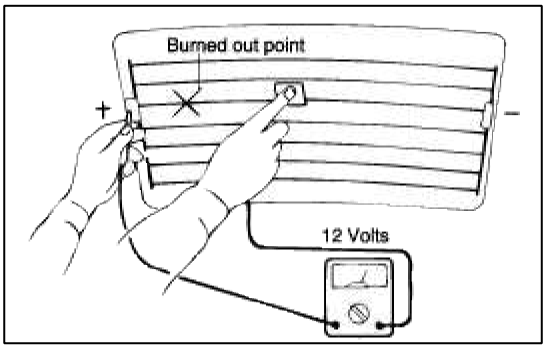
Wrap tin foil around the end of the voltmeter test lead to prevent damaging the heater line. Apply finger pressure on the tin foil, moving the tin foil along the grid line to check for open circuits.


Finger pressure
Tester probe
Tin foil
Printed heater line

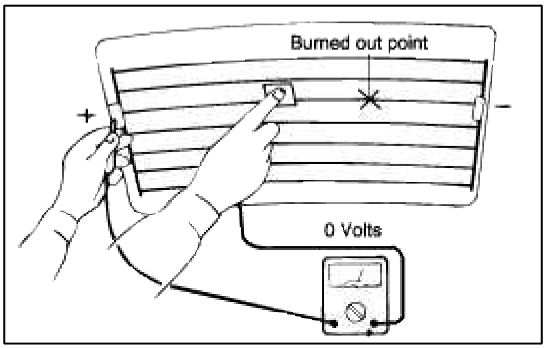
1. Turn on the defogger switch and use a voltmeter to measure the voltage of each heater line at the glass center point. If a voltage of approximately 6V is indicated by the voltmeter, the heater line of the rear window is considered satisfactory.


+
−
6 Volts (Normal)

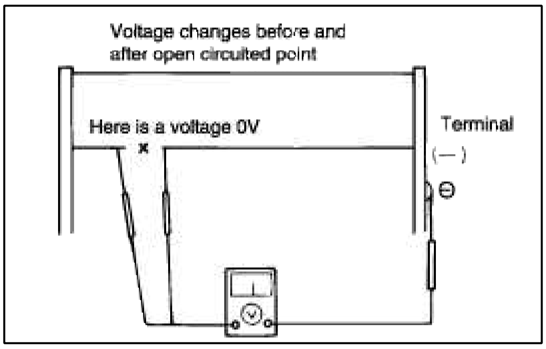
2. If a heater line is burned out between the center point and (+) terminal, the voltmeter will indicate 12V.


Burned out point
+
−
12 Volts

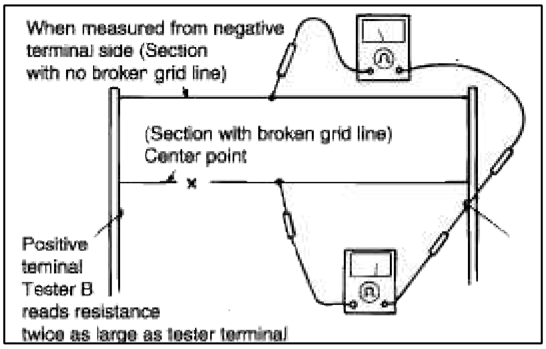
3. If a heater line is burned out between the center point and (-) terminal, the voltmeter will indicate 0V.


Burned out point
+
−
0 Volts

4. To check for open circuits, slowly move the test lead in the direction that the open circuit seems to exist. Try to find a point where a voltage is generated or changes to 0V. The point where the voltage has changed is the open-circuit point.


Voltage changes before and after open circuited point
Here is a voltage 0V
Terminal
(−)
⊖

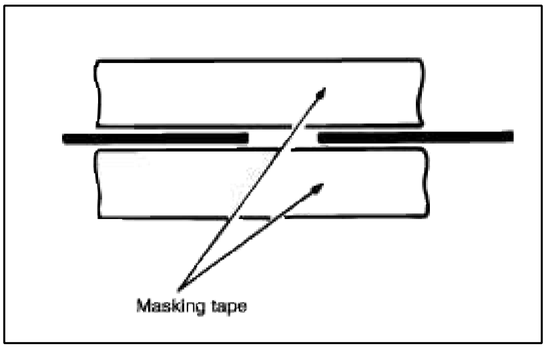
5. Use an ohmmeter to measure the resistance of each heater line between a terminal and the center of a grid line, and between the same terminal and the center of one adjacent heater line. The section with a broken heater line will have a resistance twice as that in other sections. In the affected section, move the test lead to a position where the resistance sharply changes.


When measured from negative terminal side (Section with no broker grid line)
(Section with broken grid line) Center point
Positive terminal
Tester B reads resistance twice as large as tester terminal

REPAIR OF BROKEN HEATER LINE

Prepare the following items :

1. Conductive paint.
2. Paint thinner.
3. Masking tape.
4. Silicone remover.
5. Using a thin brush :
   Wipe the glass adjacent to the broken heater line, clean with silicone remover and attach the masking tape as shown. Shake the conductive paint container well, and apply three coats with a brush at intervals of about 15 minutes apart. Remove the tape and allow sufficient time for drying before applying power. For a better finish, scrape away excess deposits with a knife after the paint has completely dried. (Allow 24 hours).

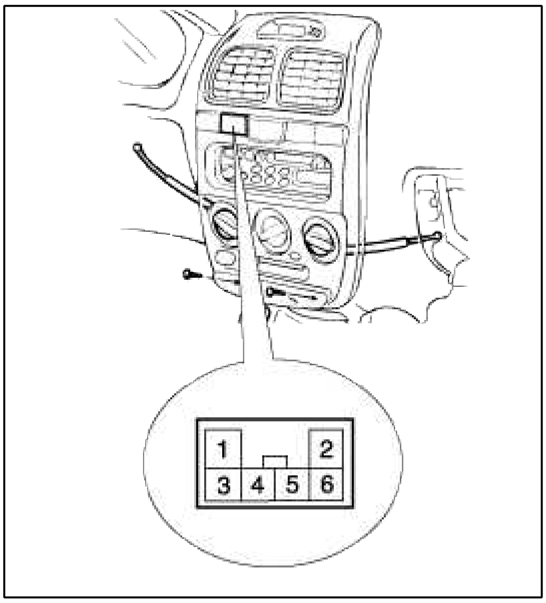

Masking tape

Body Electrical System > Rear Window Defogger > Rear Window Defogger Switch > Repair procedures

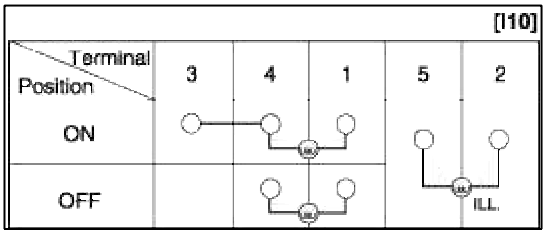
INSPECTION

1. Remove the negative(-) battery terminal.

2. Disconnect the switch connector after removing the center facia panel.

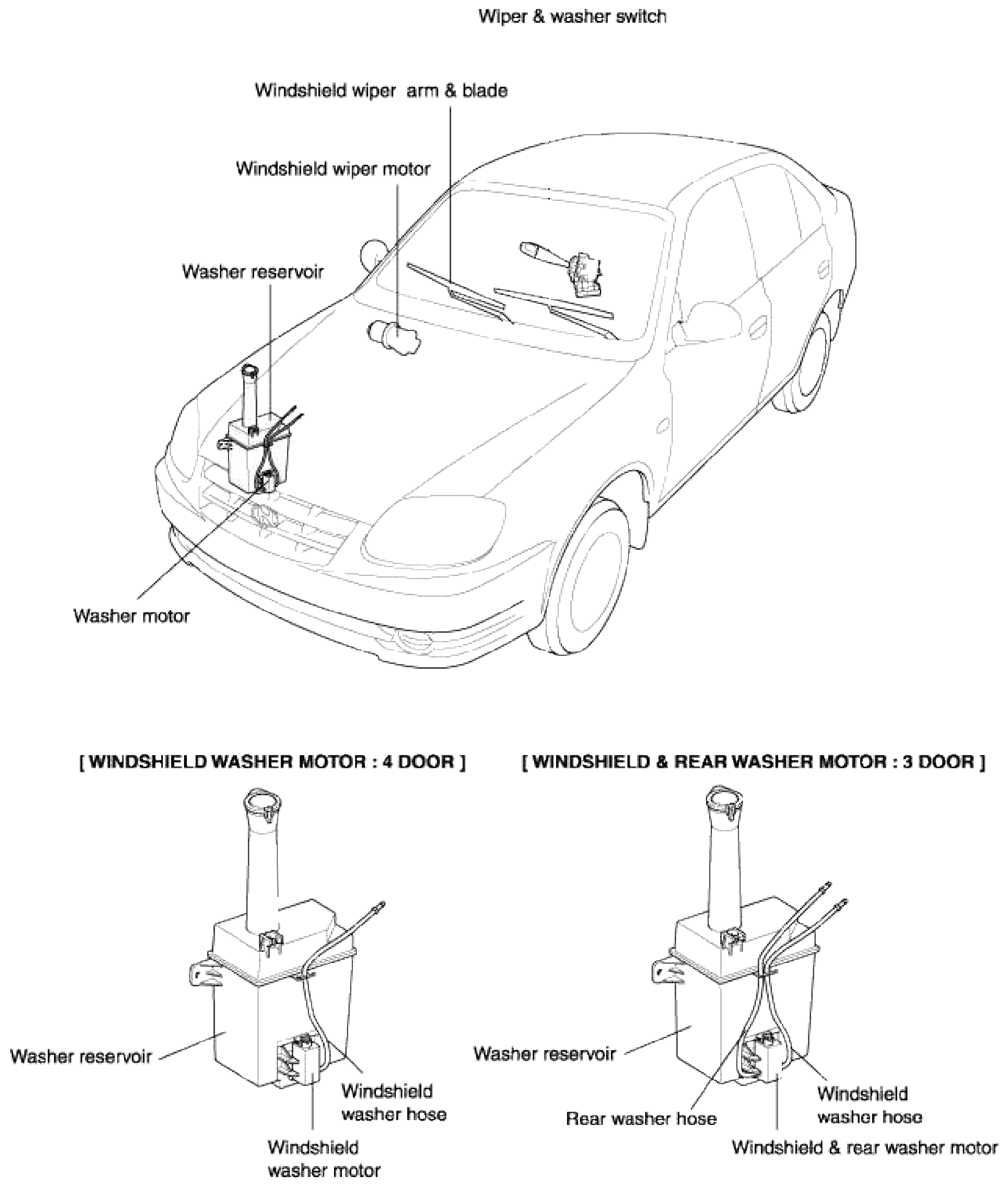


3. Check for continuity between the terminals. If continuity is not as specified in the table, replace the defogger switch.


[I10]
Terminal
Position
3
4
1
5
2
ON
OFF
ILL.

Body Electrical System > Windshield Wiper/Washer > Components and Components Location

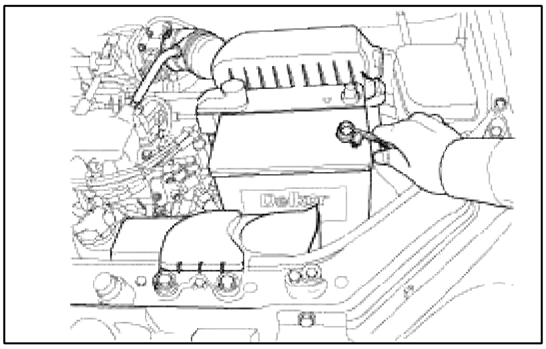
COMPONENTS


Wiper & washer switch
Windshield wiper arm & blade
Windshield wiper motor
Washer reservoir
Washer motor
[WINDSHIELD WASHER MOTOR : 4 DOOR]
[WINDSHIELD & REAR WASHER MOTOR : 3 DOOR]
Washer reservoir
Windshield washer hose
Windshield washer motor
Washer reservoir
Rear washer hose
Windshield washer hose
Windshield & rear washer motor

Body Electrical System > Windshield Wiper/Washer > Windshield Wiper/Washer Switch > Repair procedures

REMOVAL AND INSTALLATION

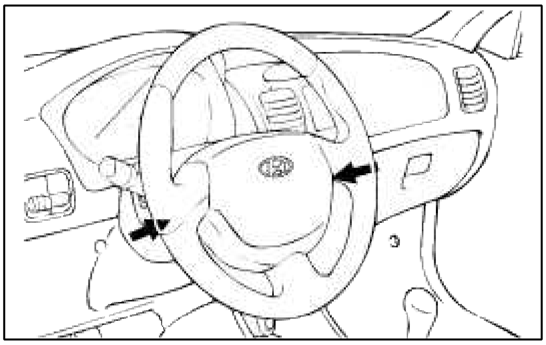
1. Disconnect the negative(-) battery terminal.



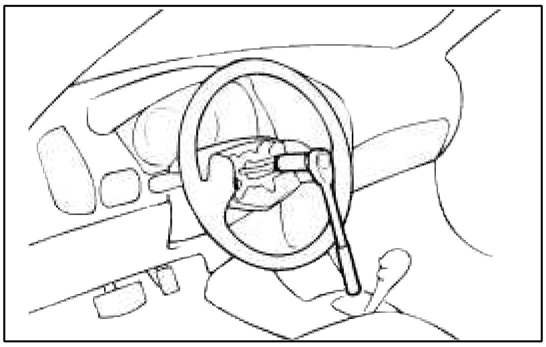
2. Remove the 2 bolts and disconnect the airbag connector and the horn connector, then remove the airbag module.

CAUTION

Remove the horn pad only for vehicle without airbag.



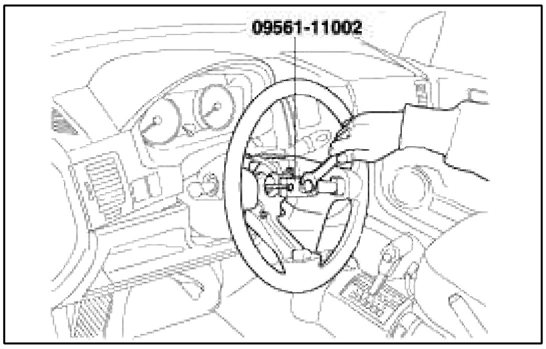
3. Remove the steering wheel lock nut.



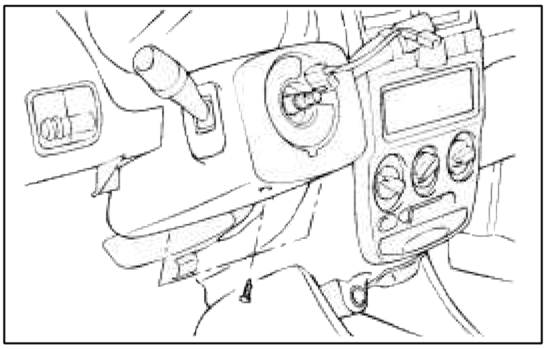
4. Remove the steering wheel with special tool (09561-11002).

CAUTION

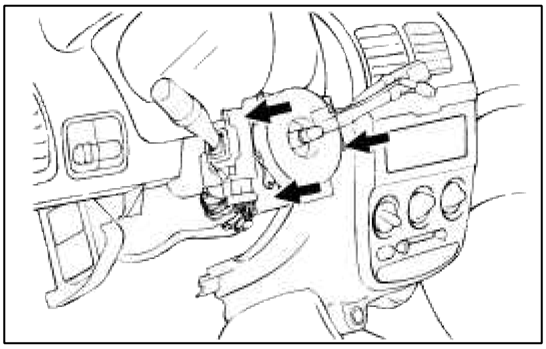
Do not hammer on the steering wheel to remove it. Doing so may damage the collapsible mechanism.



5. Remove the steering column shroud after removing 3 screws.

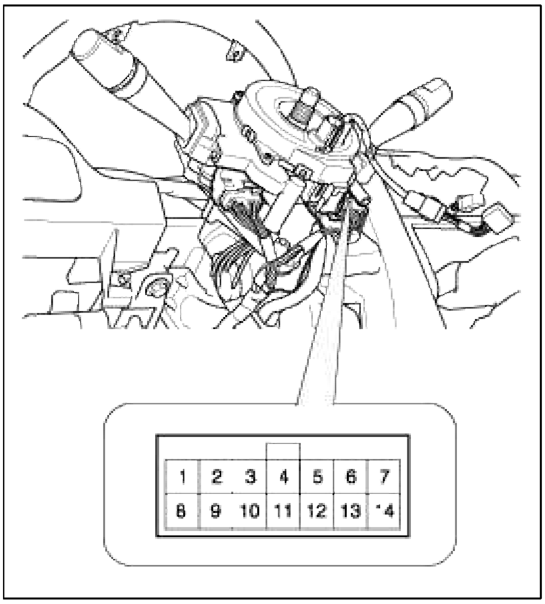


6. Disconnect the wire connectors and remove the multi-function switch after removing the screws.



7. Installation is the reverse of removal.

INSPECTION



WIPER SWITCH [M10-1]

Position \ Terminal	1	2	3	4	5	6	13	14
MIST				○	○			
OFF		○	○					
INT		○	○		○	○	○	○
LOW		○			○			
HI	○				○			

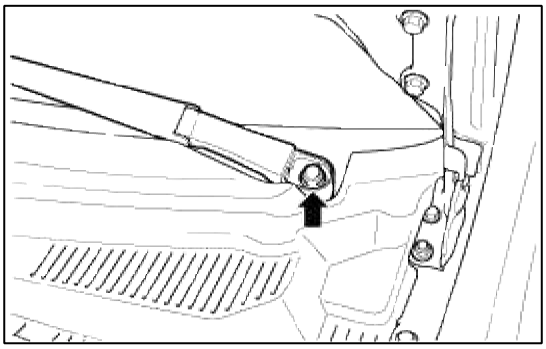
WASHER SWITCH [M10-1]

Terminal Position	5	7
OFF		
ON	○	○

Body Electrical System > Windshield Wiper/Washer > Front Wiper Motor > Repair procedures

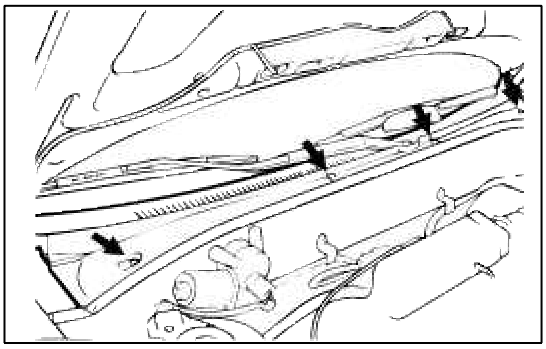
REMOVAL

1. Remove the windshield wiper arm and blade after removing a nut.

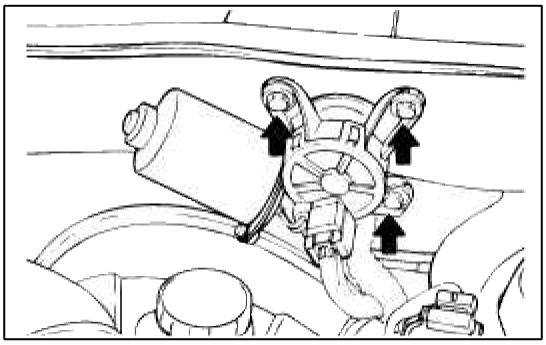


Tightening torque
28~32 Nm (280~320 kg·cm, 21~24 lb·ft)

2. Remove the weatherstrip and cowl top cover after removing 4 clips.

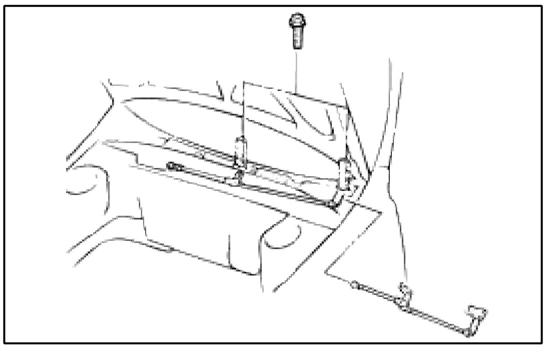


3. Remove the windshield wiper motor after removing 3 bolts.



Tightening torque
7~11 Nm (70~110 kg·cm, 5.1~8.0 lb·ft)

4. Remove the wiper link mounting bolts and take out the wiper link assembly from the cowl top panel.



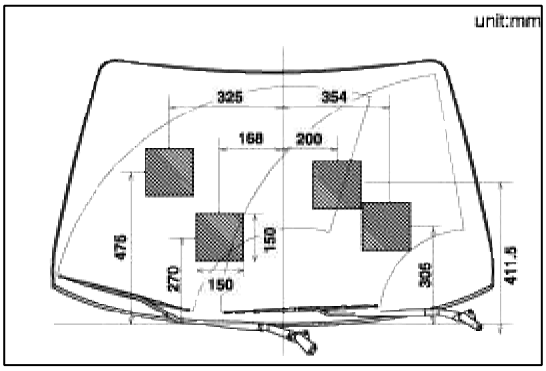
5. Installation is the reverse of removal.

INSTALLATION

1. Install the wiper arm and blade to the specified position.

Specified position	A	B
Distance (mm)	25~35	25~35

2. Set the washer nozzle on the specified spray position.

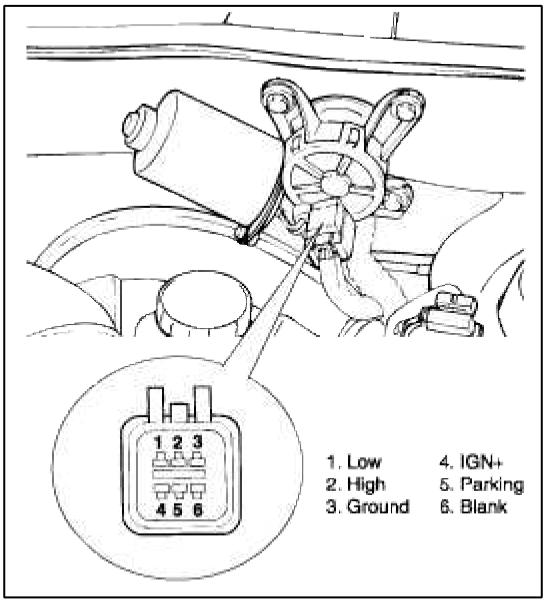


INSPECTION

SPEED OPERATION CHECK

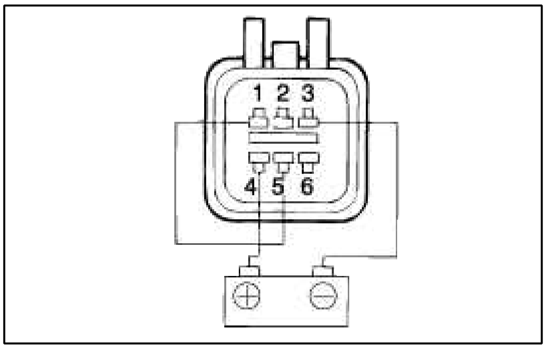
1. Remove the connector from the wiper motor.
2. Attach the positive (+) lead from the battery to terminal 1 and the negative (-) lead to terminal 3.
3. Check that the motor operates at low speed.
4. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 3.

5. Check that the motor operates at high speed.



AUTOMATIC STOP OPERATION CHECK

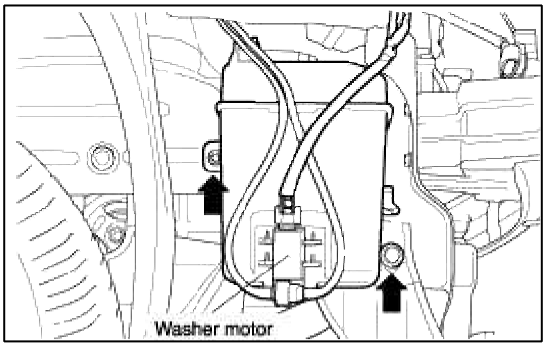
1. Operate the motor at low speed using the stalk control.
2. Stop the motor operation anywhere except at the off position by disconnecting terminal 1
3. Connect terminals 1and 5.
4. Connect the positive (+) lead from the battery to terminal 4 and the negative (-) lead to terminal 3.
5. Check that the motor stops running at the off position.



Body Electrical System > Windshield Wiper/Washer > Front Washer Motor > Repair procedures

REMOVAL AND INSTALLATION

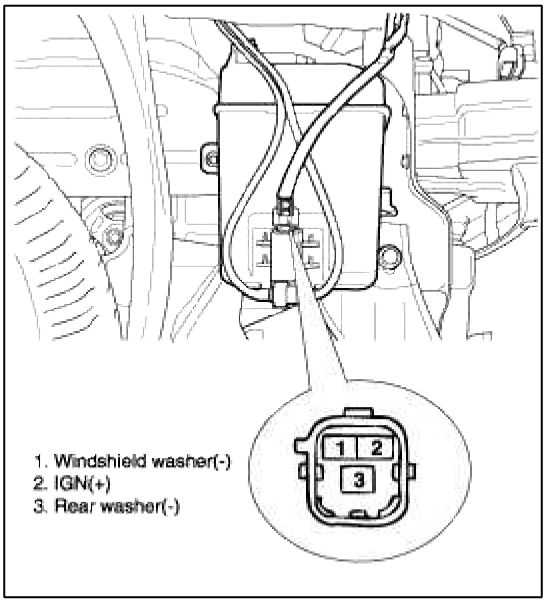
1. Disconnect the negative(-) battery terminal.
2. Remove the front bumper cover. (see BD group - front bumper)
3. Remove the washer hose and the washer motor connector.
4. Remove the washer reservoir after removing 2 bolts.

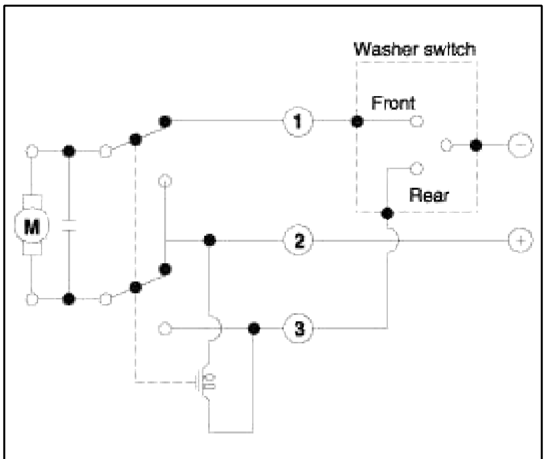


5. Installation is the reverse of removal.

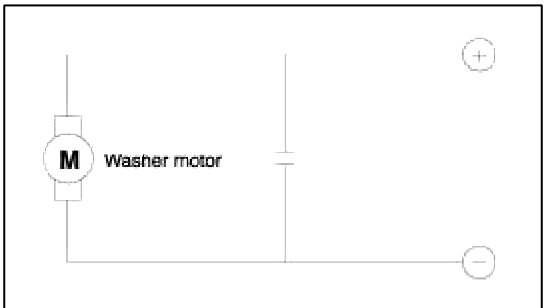
INSPECTION

1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.
2. Connect positive (+) and negative (-) battery cables to terminals 2 and 1 respectively to see that the washer motor runs and water sprays from the front nozzles.
3. Check that the motor operates normally.


1. Windshield washer(-)
2. IGN(+)
3. Rear washer(-)
1
2
3


Washer switch
Front
Rear
M
1
2
3
⊖
⊕

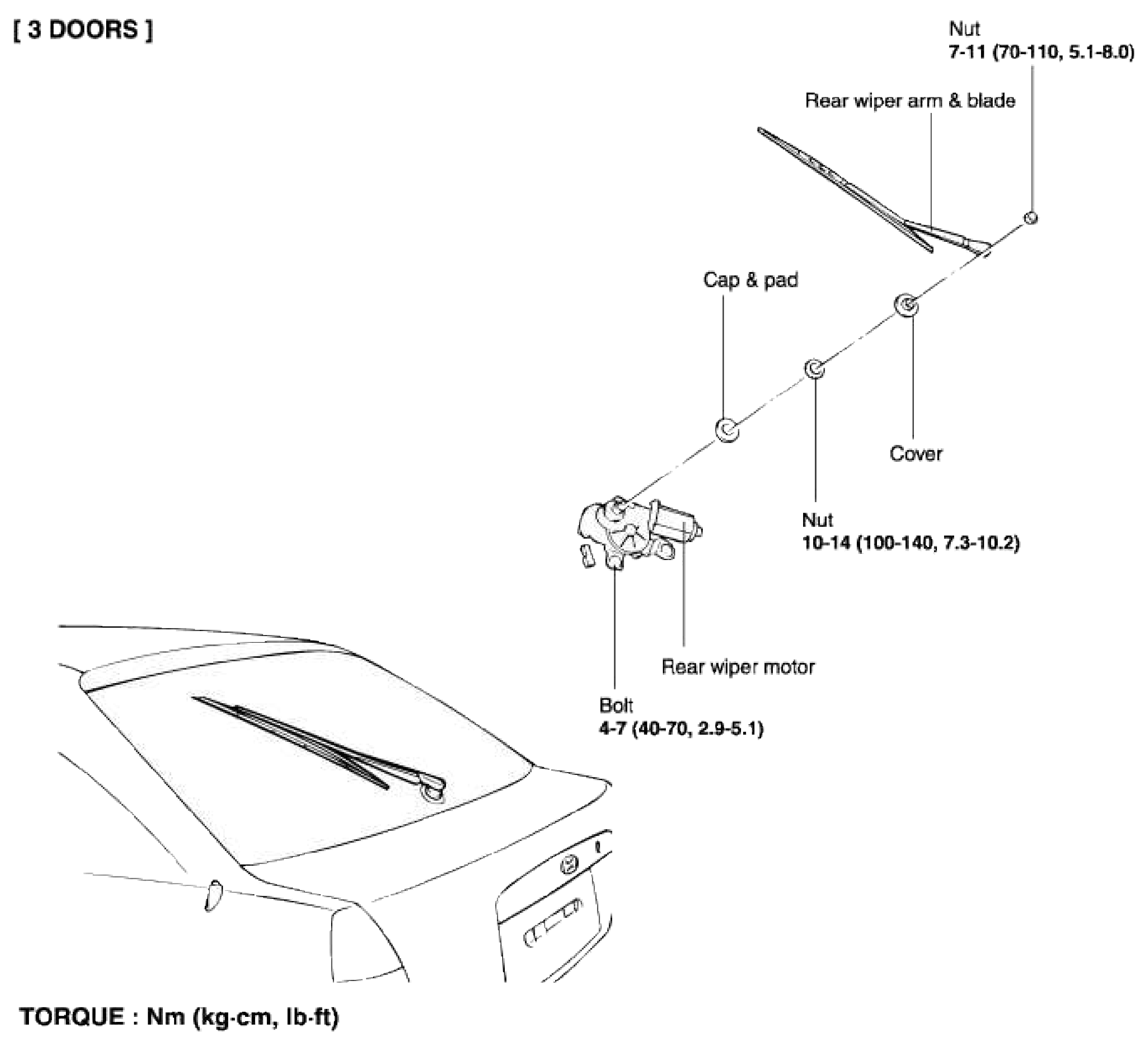
< Windshield & rear washer motor : 3 door >


M
Washer motor
⊕
⊖

< Windshield washer motor : 4 door >

Body Electrical System > Rear Wiper/Washer > Rear Wiper Motor > Components and Components Location

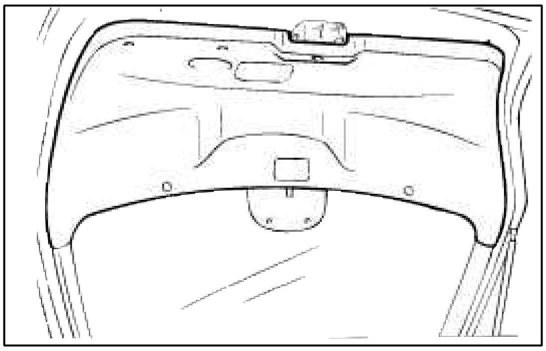
COMPONENTS


[3 DOORS]
Nut
7-11 (70-110, 5.1-8.0)
Rear wiper arm & blade
Cap & pad
Cover
Nut
10-14 (100-140, 7.3-10.2)
Rear wiper motor
Bolt
4-7 (40-70, 2.9-5.1)
TORQUE : Nm (kg-cm, lb-ft)

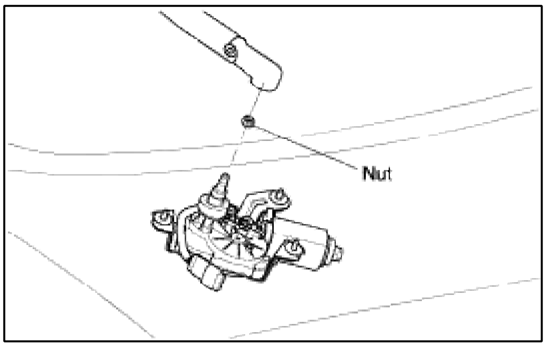
Body Electrical System > Rear Wiper/Washer > Rear Wiper Motor > Repair procedures

REMOVAL

1. Remove the tailgate trim panel.



2. Remove the rear wiper arm after removing a nut.



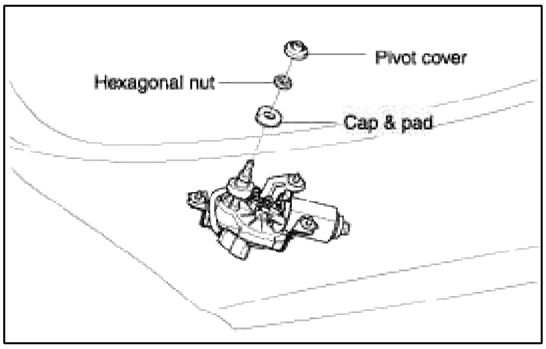
Tightening torque
7~11 Nm (70~110 kg·cm, 5.1~8.0 lb·ft)

---

3. Remove a hexagonal nut after removing a pivot cover.

NOTE

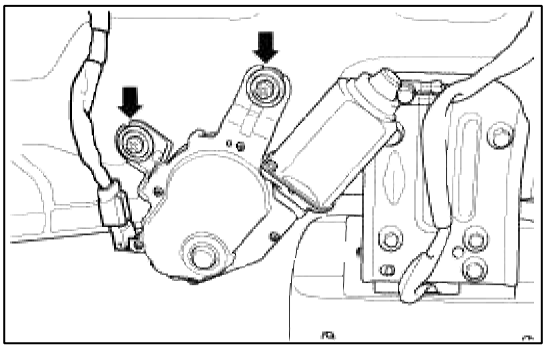
When installing cap & pad, the arrow mark should be indicated upward.



Tightening torque
10~14 Nm (100~140 kg·cm, 7.3~10.2 lb·ft)

---

4. Remove the rear wiper motor after removing 2 bolts and disconnect the wire connector.



Tightening torque
4~7 Nm (40~70 kg·cm, 2.9~5.1 lb·ft)

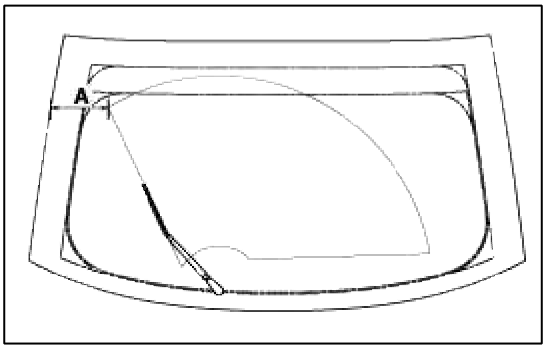
---

5. Installation is the reverse of removal.

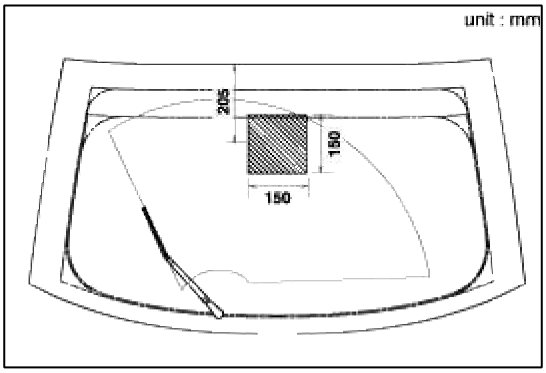
INSTALLATION

1. Install the rear wiper arm and blade to the specified position.

Specified position	A
Distance	150±10 mm

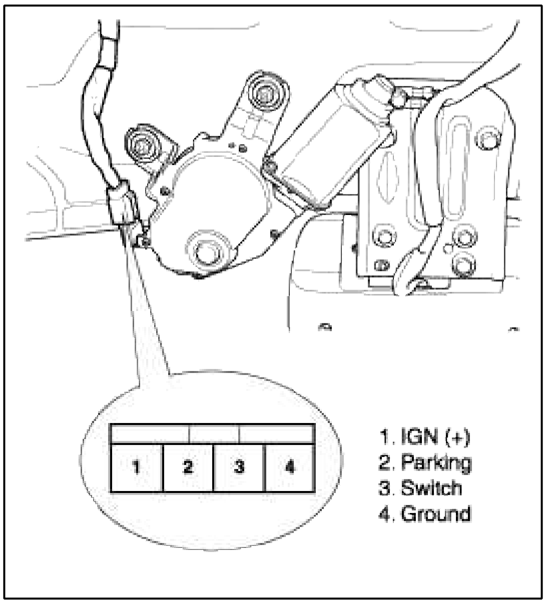


2. Set the rear washer nozzle on the specified spray position.



INSPECTION

1. Remove the connector from the rear wiper motor.
2. Connect battery positive (+) and negative (-) cables to terminals 1 and 4 respectively.
3. Check that the motor operates normally. Replace the motor if it operates abnormally.

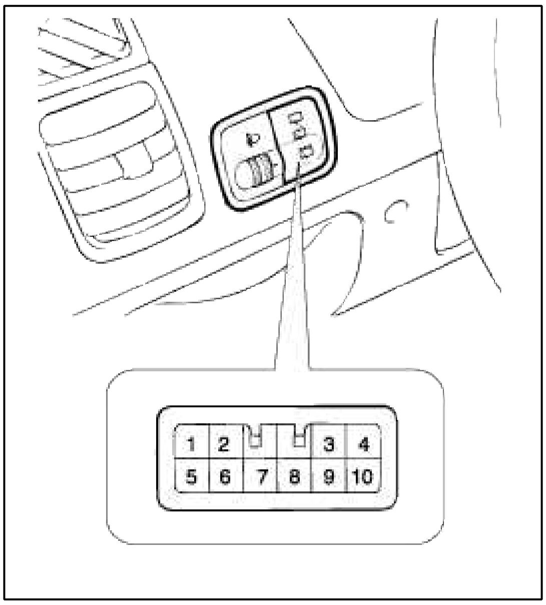


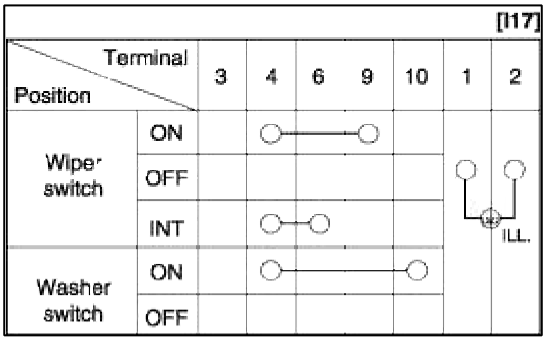
Body Electrical System > Rear Wiper/Washer > Rear Washer Switch > Repair procedures

INSPECTION

1. Disconnect the connector from the rear wiper and washer switch.

2. Check for continuity between the terminals.





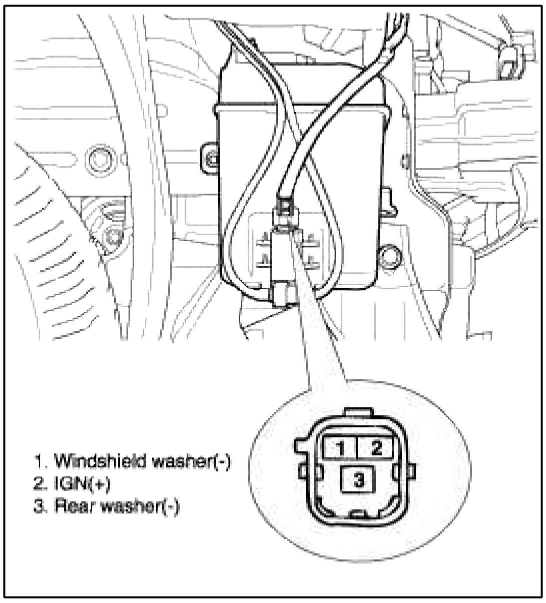
[I17]

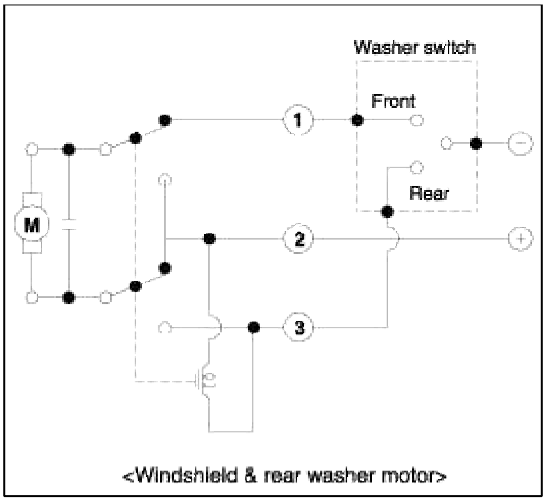
Position		3	4	6	9	10	1	2
Wiper switch	ON		○	—	○		○	○ ILL.
	OFF							
	INT		○	○				
Washer switch	ON		○	—	—	○		
	OFF							

Body Electrical System > Rear Wiper/Washer > Rear Washer Motor > Repair procedures

INSPECTION

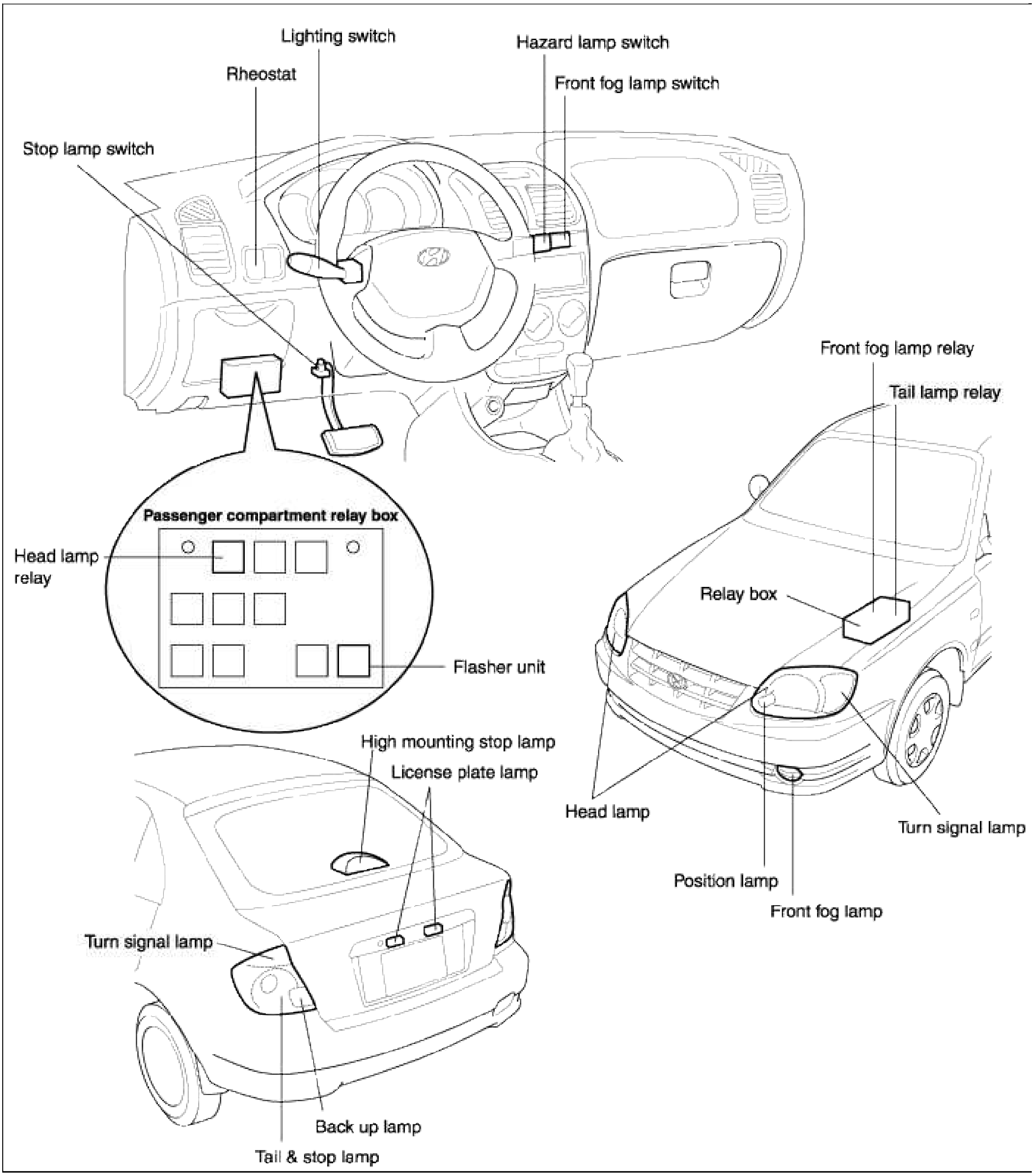
1. With the washer motor connected to the reservoir tank, fill the reservoir tank with water.
2. Connect positive(+) and negative(-) battery cables to terminals 2 and 3 respectively to see that the washer motor runs and water is pumped.
3. Check that the motor operates normally.
   Replace the motor if it operates abnormally.




Washer switch
Front
Rear
M
1
2
3
<Windshield & rear washer motor>

Body Electrical System > Lighting System > Components and Components Location

COMPONENTS

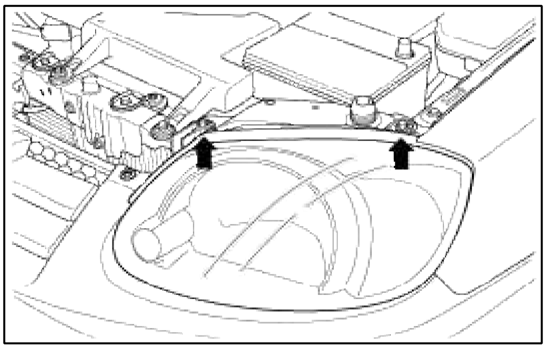

Lighting switch
Hazard lamp switch
Rheostat
Front fog lamp switch
Stop lamp switch
Front fog lamp relay
Tail lamp relay
Passenger compartment relay box
Head lamp relay
Relay box
Flasher unit
High mounting stop lamp
License plate lamp
Head lamp
Turn signal lamp
Position lamp
Front fog lamp
Turn signal lamp
Back up lamp
Tail & stop lamp

Body Electrical System > Lighting System > Head Lamps > Repair procedures

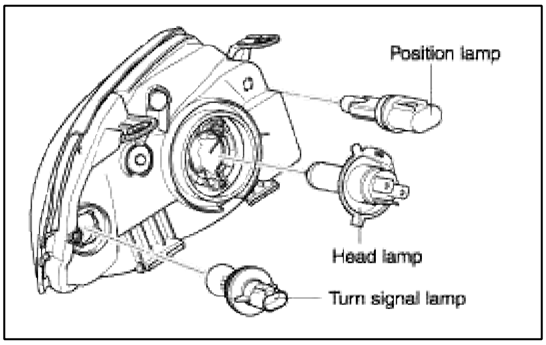
REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.

2. Remove the head lamp mounting bolts (2EA), then disconnect the lamp connectors.



3. Replace a burned-out bulb by a new one.



4. Installation is the reverse of removal.

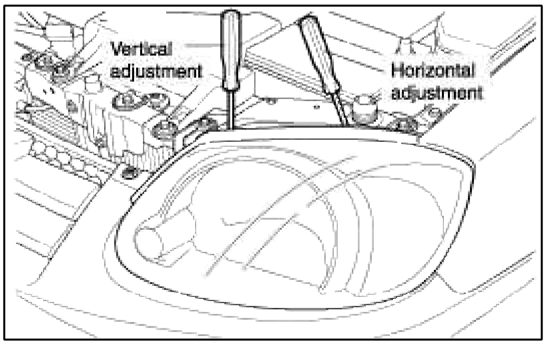
AIMING INSTRUCTIONS

HEAD LAMP AIMING

NOTE

If there are any regulations pertinent to the aiming of head lamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

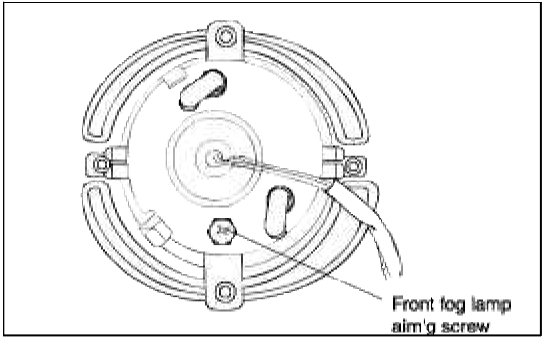
1. Inflate the tires to the specified pressure and remove any loads from the vehicle except the driver, spare tire, and tools.
2. The vehicle should be placed on a flat floor.
3. Draw vertical lines (Vertical lines passing through respective head lamp centers) and a horizontal line (Horizontal line passing through center of head lamps) on the screen.
4. With the head lamp and battery in normal condition, aim the head lamps so the brightest portion falls on the horizontal and vertical lines.
   Make vertical and horizontal adjustments to the lower beam using the adjusting wheel.

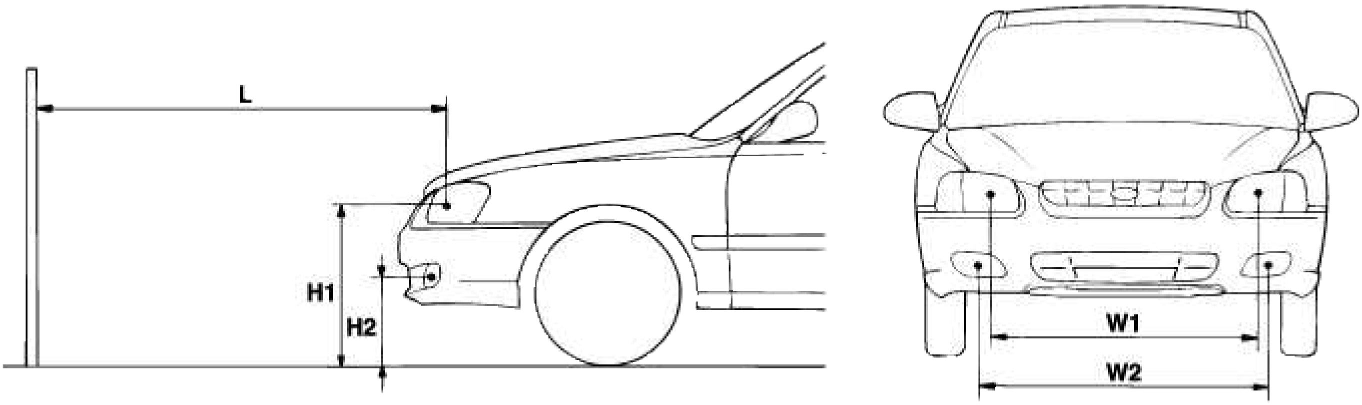


FRONT FOG LAMP AIMING

The front fog lamps should be aimed as the same manner of the head lamps aiming.

With the front fog lamps and battery normal condition, aim the front fog lamps by turning the adjusting gear.





H1 : Height between the head lamp bulb center and ground
H2 : Height between the fog lamp bulb center and ground

W1 : Distance between the head lamp bulb center
W2 : Distance between the fog lamp bulb center

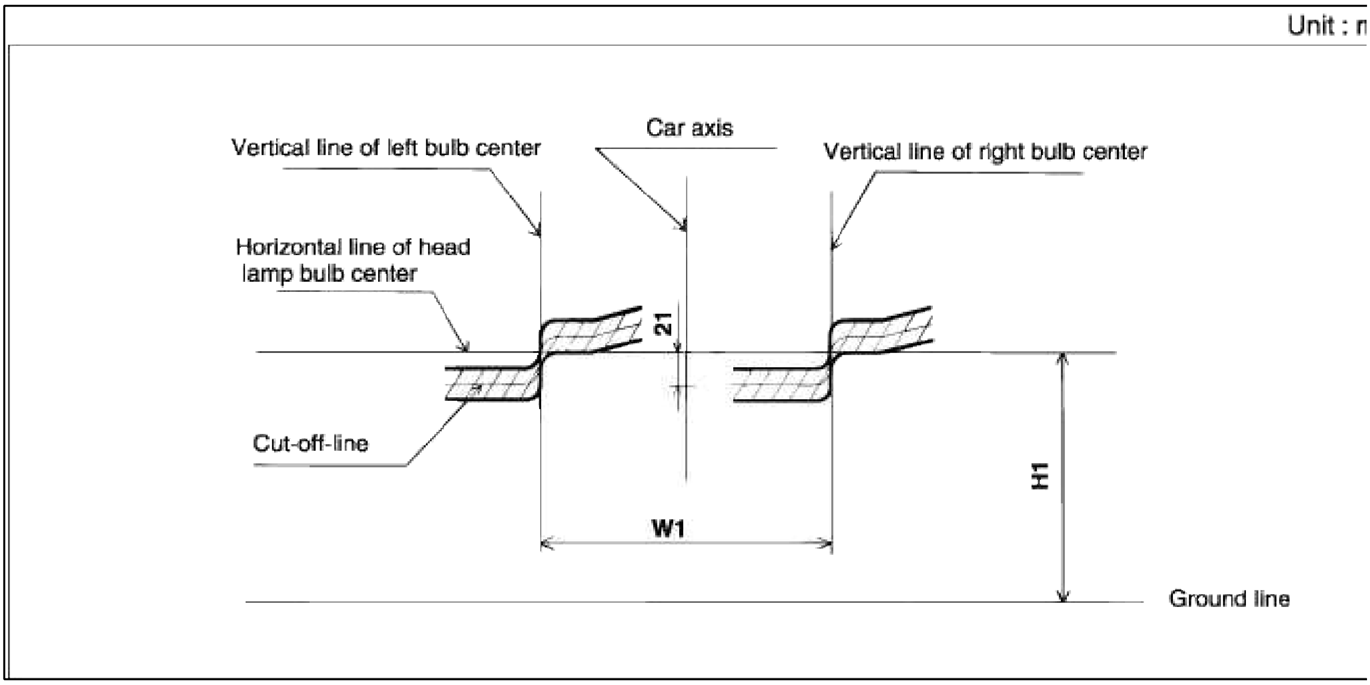
L : Distance between the head lamp bulb center and screen

HEAD LAMP AND FOG LAMP AIMING POINT

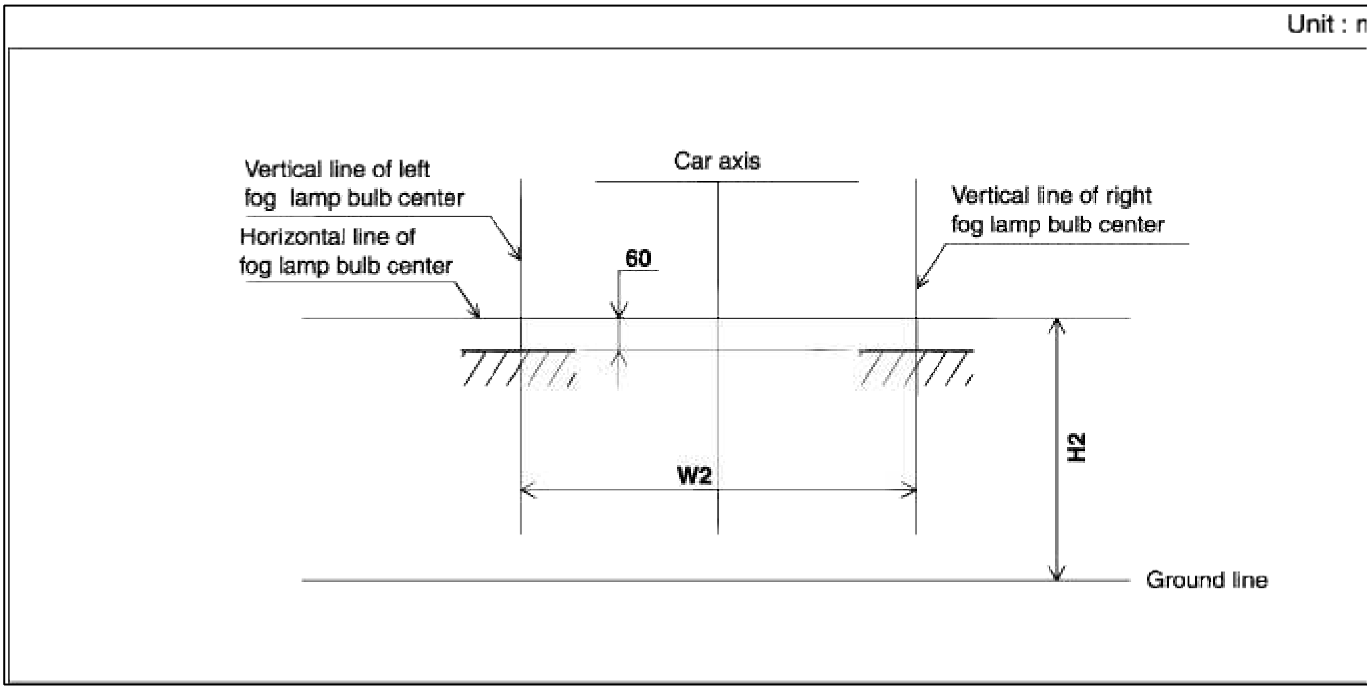
Unit : mm

Vehicle condition	H1	H2	W1	W2	L
Without driver	665	340	1,078	1,134	3,000
With driver	656	331			

1. Turn the low beam on without driver aboard.
   The cut-off line should be projected in the allowable range (shaded region).


Unit :
Car axis
Vertical line of left bulb center
Vertical line of right bulb center
Horizontal line of head lamp bulb center
21
Cut-off-line
H1
W1
Ground line

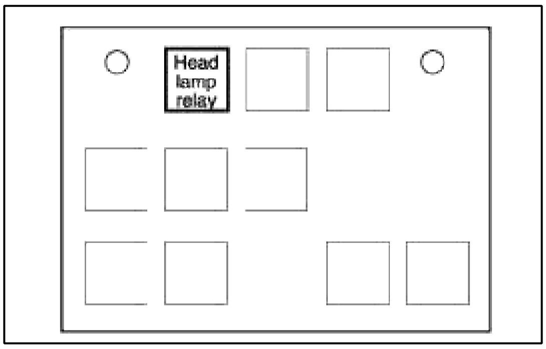
2. Turn the front fog lamp on without driver aboard.
   The cut-off line should be projected in the allowable range (shaded region).


Unit :
Car axis
Vertical line of left fog lamp bulb center
Horizontal line of fog lamp bulb center
Vertical line of right fog lamp bulb center
60
H2
W2
Ground line

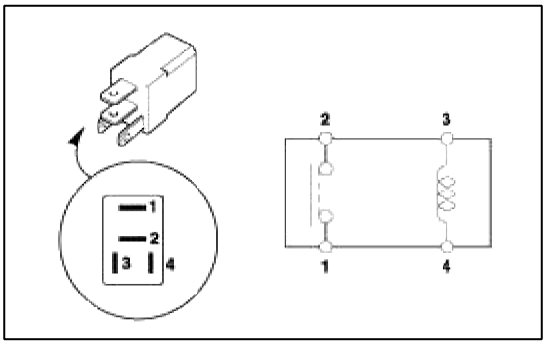
INSPECTION

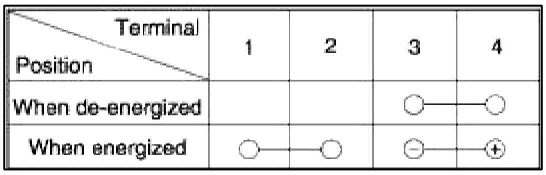
HEAD LAMP RELAY

1. Pull out the headlamp relay from the relay box in the passenger compartment.


Head lamp relay

2. Check for continuity between terminals.



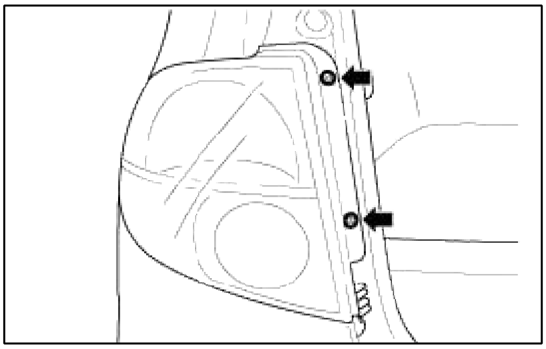


Position \ Terminal	1	2	3	4
When de-energized			○—	—○
When energized	○—	—○	⊖—	—⊕

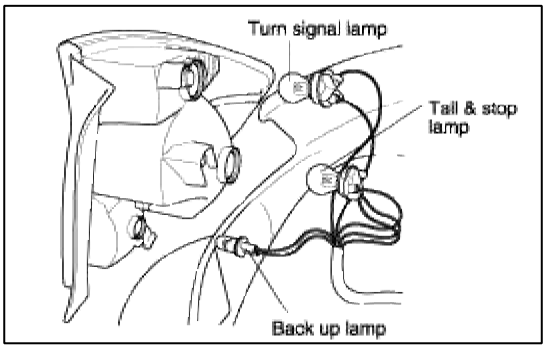
Body Electrical System > Lighting System > Turn Signal Lamp > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.
2. Remove the 2 screws holding the rear combination lamp.



3. Disconnect the wire connector from the rear combination lamp.
4. Replace a burned-out bulb by a new one.

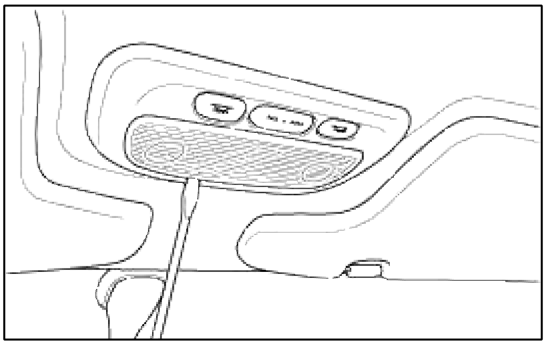

Turn signal lamp
Tail & stop lamp
Back up lamp

5. Installation is the reverse of removal.

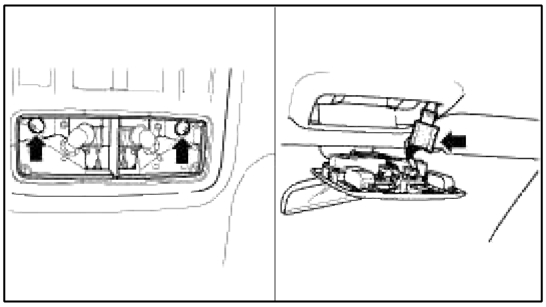
Body Electrical System > Lighting System > Room Lamp > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.
2. Detach the lamp lens from the room lamp with a flat-tip screwdriver.

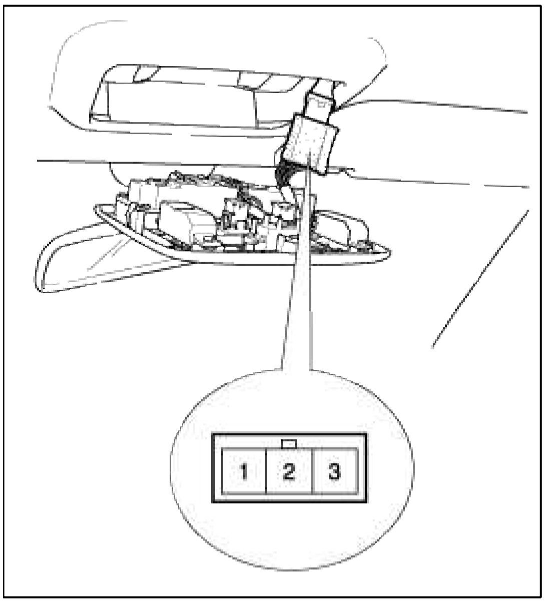


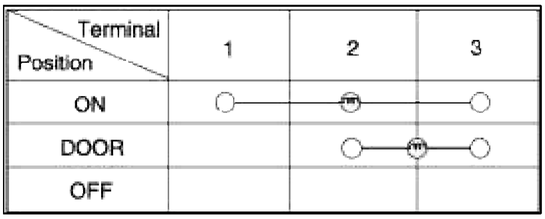
3. Remove the mounting screws (2EA) and disconnect the wire connector, then remove the room lamp assembly.



4. Installation is the reverse of removal.

INSPECTION



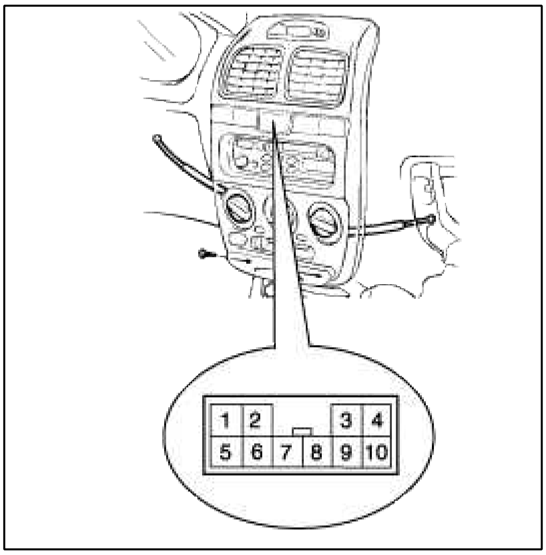


Terminal / Position	1	2	3
ON	○—	—⊗—	—○
DOOR		○—⊗	—○
OFF			

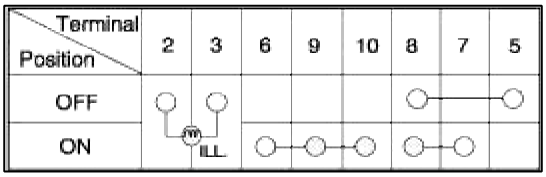
Body Electrical System > Lighting System > Hazard Lamp Switch > Repair procedures

INSPECTION

1. Disconnect the negative(-) battery terminal.
2. Remove the center facia panel with a flat-tip screwdriver, then disconnect the switch connector.



3. Operate the switch and check for continuity between terminals with an ohmmeter.

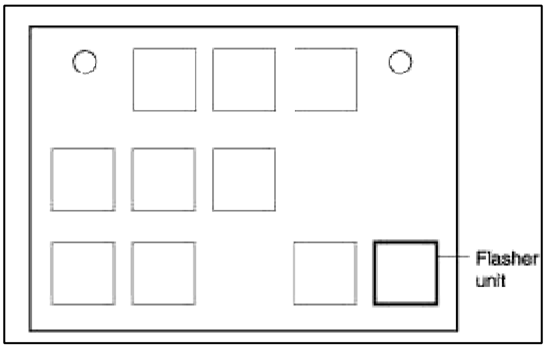


Terminal / Position	2	3	6	9	10	8	7	5
OFF	○	○				○		○
ON	ILL		○	○	○	○	○	

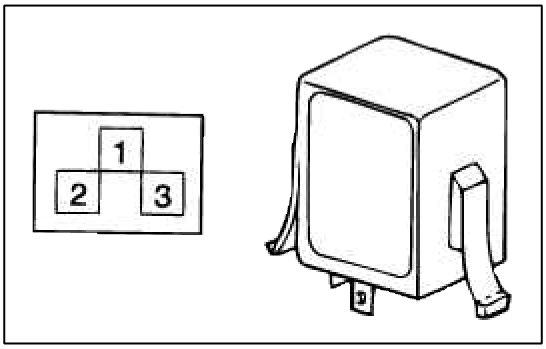
Body Electrical System > Lighting System > Flasher Unit > Repair procedures

INSPECTION

1. Remove the flasher unit from the passenger compartment relay box.



2. Connect the positive (+) lead from the battery to terminal 2 and the negative (-) lead to terminal 3.



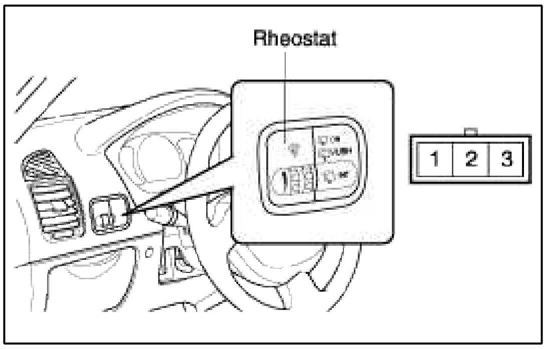
3. Connect the two turn signal lamps in parallel to terminal 1. Check that the bulbs turn on and off.

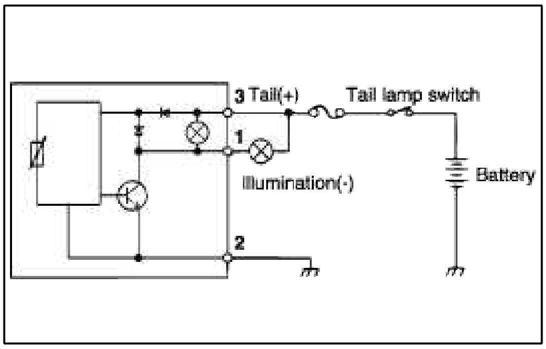
> **NOTE**
>
> The turn signal lamps should flash 60 to 120 times per minute. If one of the front or rear turn signal lamps has an open circuit, the number of flashes will be more than 120 per minute. If operation is not as specified, replace the flasher unit.

Body Electrical System > Lighting System > Rheostat > Repair procedures

INSPECTION

1. Disconnect the negative(-) battery terminal.
2. Detach the rheostat connector from the driver's crash pad panel.



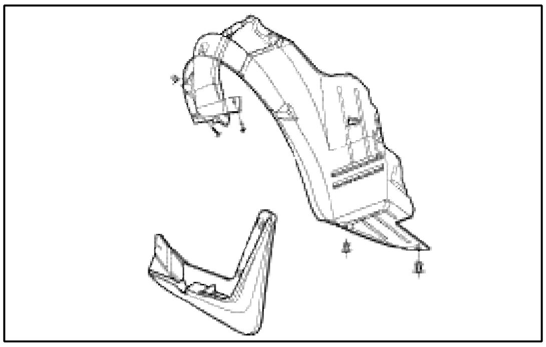


3. Check for intensity. If the light intensity of the lamps changes smoothly without any flickering when the rheostat is turned, it can be assumed that the rheostat is normal.

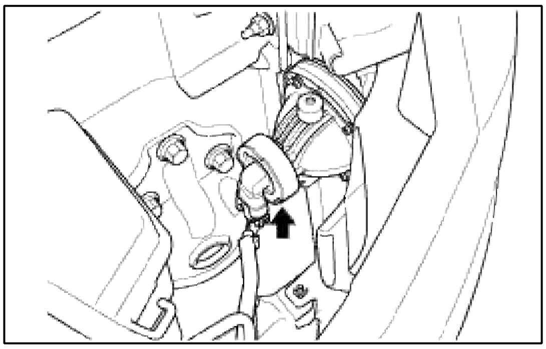
Body Electrical System > Lighting System > Front Fog Lamps > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.
2. Remove the front wheel guard.



3. Remove the front fog lamp assembly after removing the screws, then disconnect the wire connector.

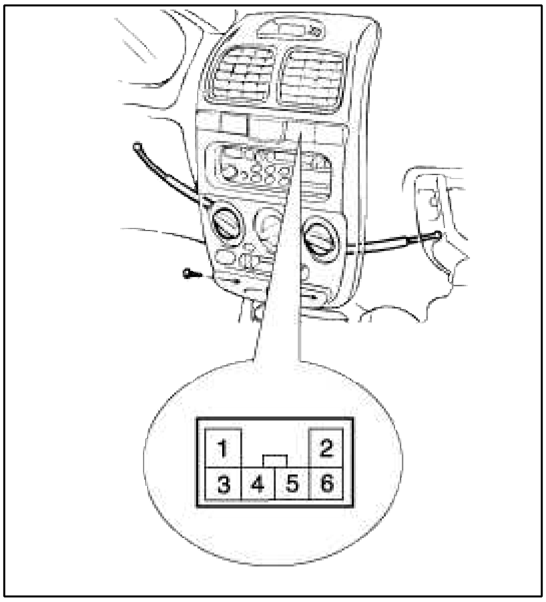


4. Installation is the reverse of removal.

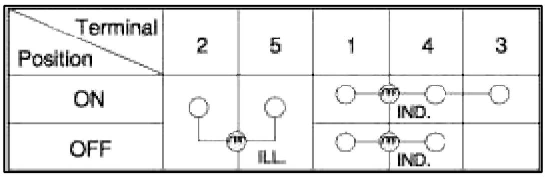
INSPECTION

FRONT FOG LAMP SWITCH

1. Disconnect the negative(-) battery terminal.
2. Remove the center facia panel with a flat-tip screwdriver, then disconnect the switch connector.



3. Operate the switch and check for continuity between terminals with an ohmmeter.

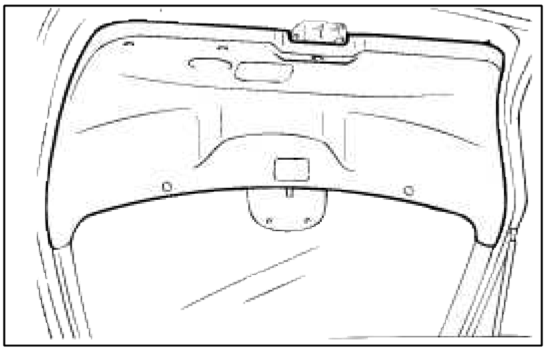


Terminal / Position	2	5	1	4	3
ON	○	○ ILL.	○	IND.	○
OFF			○	IND.	

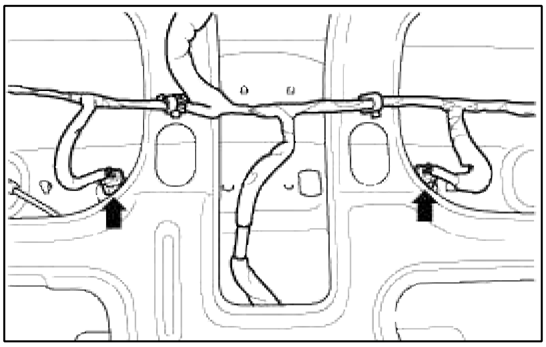
Body Electrical System > Lighting System > License Lamps > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative (-) battery terminal.
2. Remove the tailgate trim.



3. Remove the license plate lamp and disconnect the wire connector.

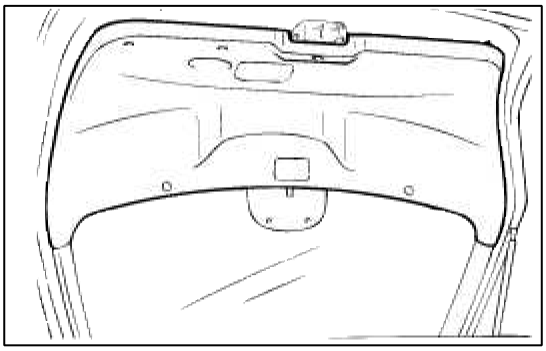


4. Installation is the reverse of removal.

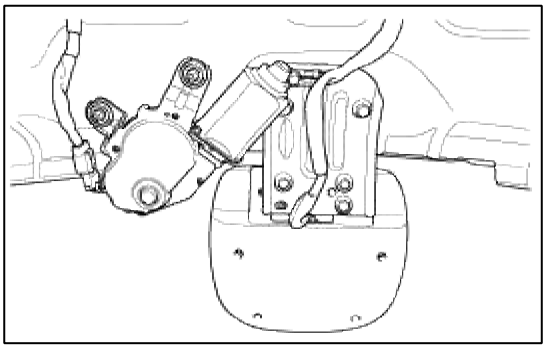
Body Electrical System > Lighting System > High Mounted stop lamp > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative(-) battery terminal.
2. Remove the tailgate trim.



3. Remove the 5 bolts, disconnect the wire connector and then remove the center high mounted stop lamp.

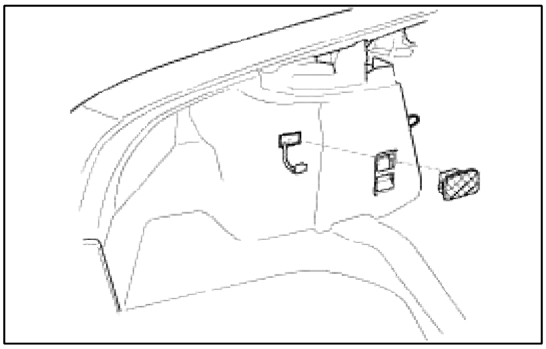


4. Installation is the reverse of removal.

Body Electrical System > Lighting System > Trunk Lamps > Repair procedures

REMOVAL AND INSTALLATION

1. Disconnect the negative battery terminal.
2. Detach the luggage lamp assembly from the luggage side trim with a flat-tip screwdriver.

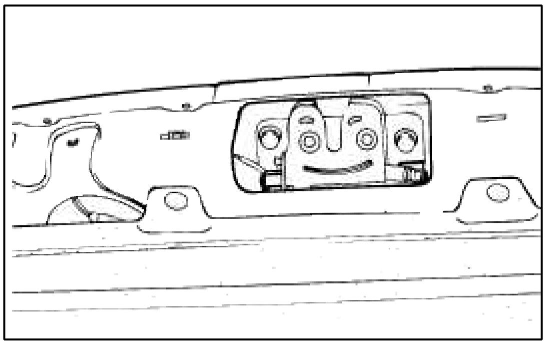


3. Installation is the reverse of removal.

INSPECTION

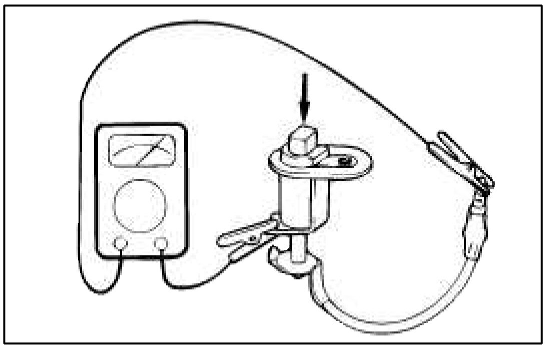
TRUNK ROOM LAMP SWITCH

1. Disconnect the negative battery terminal.
2. After opening the trunk, disconnect the connector from the rear harness.



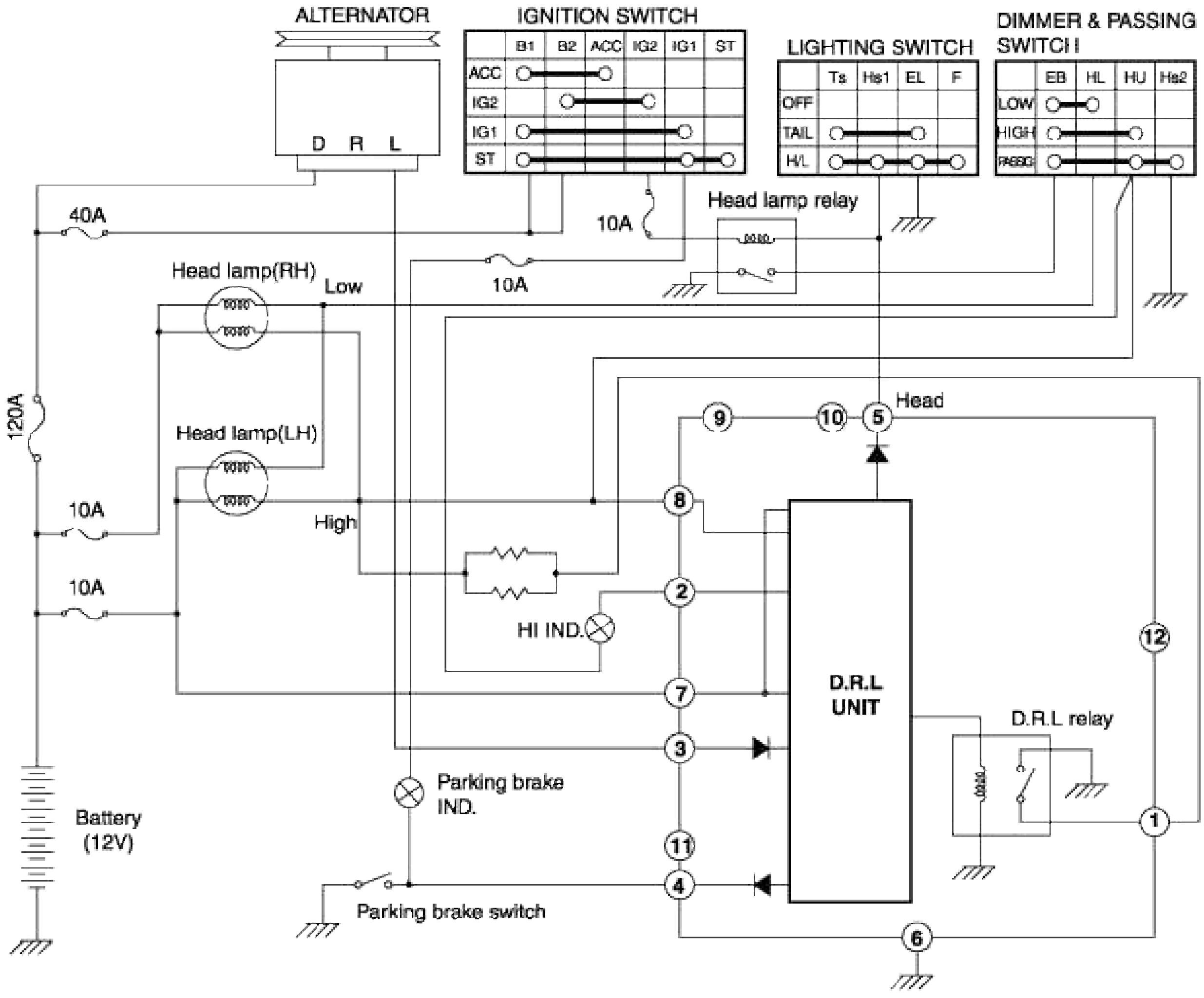
3. Check for continuity between the terminal and body while pushing the rod.

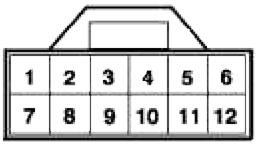
Switch rod condition	Continuity
Pushed (OFF)	Non-conductive (∞Ω)
Released (ON)	Conductive (0Ω)



Body Electrical System > Daytime Running Lights > DRL Control Module > Schematic Diagrams

CIRCUIT DIAGRAM


ALTERNATOR
D R L
IGNITION SWITCH
B1 B2 ACC IG2 IG1 ST
ACC
IG2
IG1
ST
LIGHTING SWITCH
Ts Hs1 EL F
OFF
TAIL
H/L
DIMMER & PASSING SWITCH
EB HL HU Hs2
LOW
HIGH
PASSG
40A
10A
Head lamp relay
10A
Head lamp(RH)
Low
120A
Head lamp(LH)
High
10A
10A
HI IND.
Head
9
10
5
8
2
7
3
11
4
6
12
1
D.R.L UNIT
D.R.L relay
Parking brake IND.
Parking brake switch
Battery (12V)


1 2 3 4 5 6
7 8 9 10 11 12

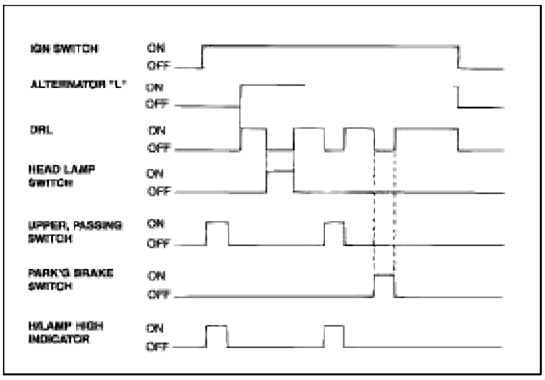
(DRL control module side connector)

Body Electrical System > Daytime Running Lights > DRL Control Module > Repair procedures

INSPECTION

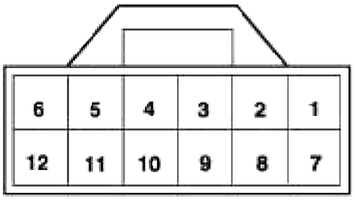
OPERATION CHECK

Check that the lights operate according to the following timing chart.



INSPECT CIRCUITS FOR DAYTIME RUNNING LIGHT SYSTEM

1. Disconnect the wire connector to DRL module from engine compartment.
2. Inspect the connector on wire harness side as shown.



(DRL module harness side connector)

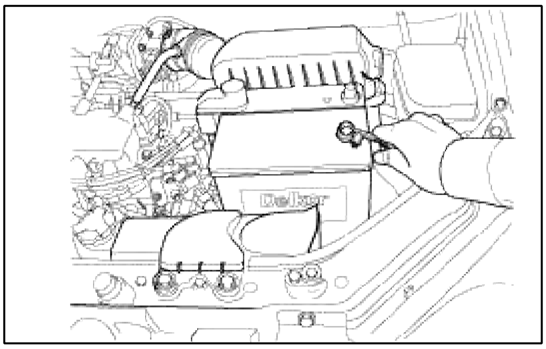
Tester connection	Condition	Specified condition
5-Ground	Head lamp switch OFF	No continuity
	Head lamp switch ON	Continuity
6-Ground	Constant	Continuity
7-Ground	Constant	Battery voltage
8-Ground	Dimmer & passing switch ON	No voltage
	Dimmer & passing switch OFF	Battery voltage
3-Ground	Engine Stop	No voltage
	Engine Running	Battery voltage
4-Ground	Parking brake switch ON	Continuity
	Parking brake switch OFF	No continuity

If circuit is not as specified, refer to schematic diagram and inspect short or circuits.

Body Electrical System > Ignition System > Ignition Switch > Repair procedures

REMOVAL AND INSTALLATION

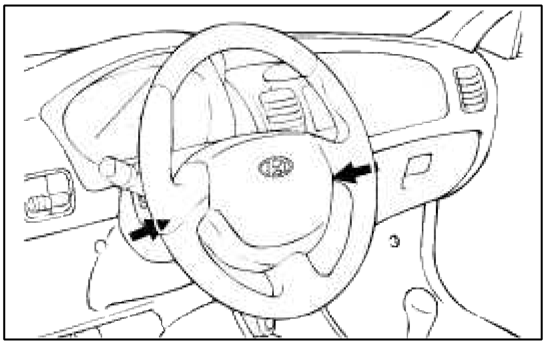
1. Disconnect the negative(-) battery terminal.



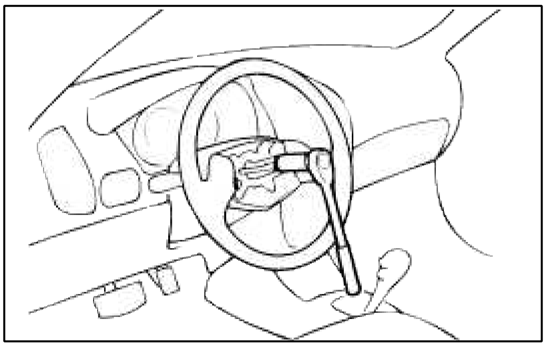
2. Remove the 2 bolts and disconnect the airbag connector and the horn connector, then remove the airbag module.

CAUTION

Remove the horn pad only for vehicle without airbag.



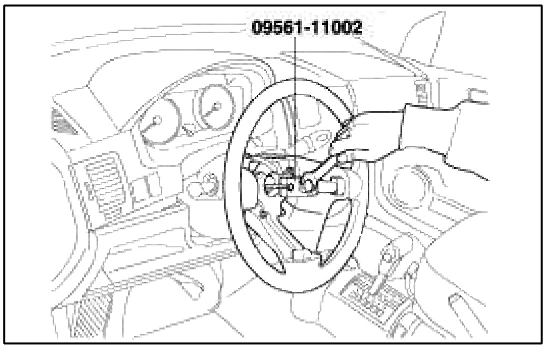
3. Remove the steering wheel lock nut.



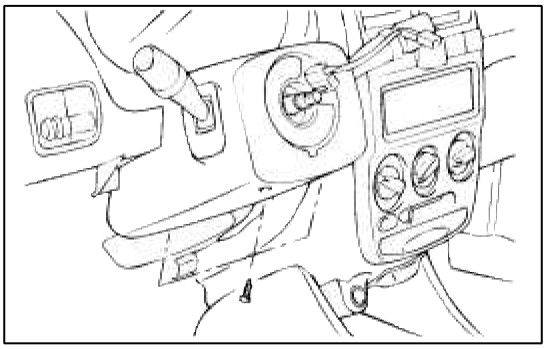
4. Remove the steering wheel with special tool (09561-11002).

CAUTION

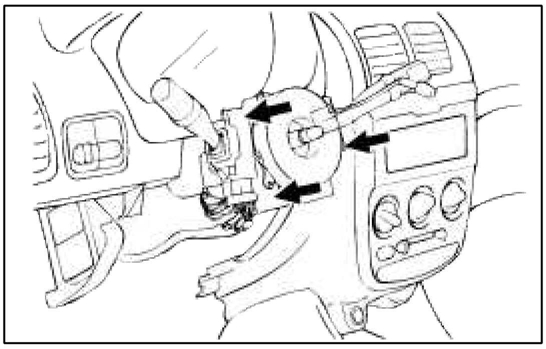
Do not hammer on the steering wheel to remove it. Doing so may damage the collapsible mechanism.



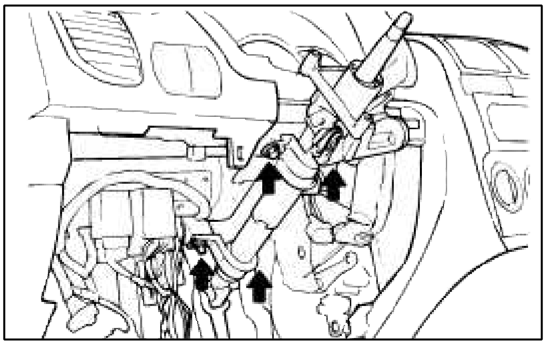
5. Remove the steering column shroud after removing 3 screws.



6. Remove the screws holding the multi-function switch, then disconnect the wire connector.
   Remove the multi-function switch assembly.



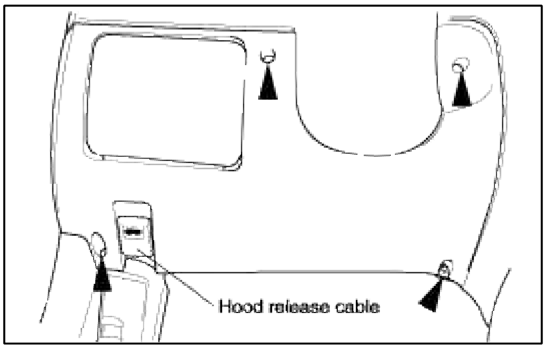
7. Remove the steering column mounting bolts.



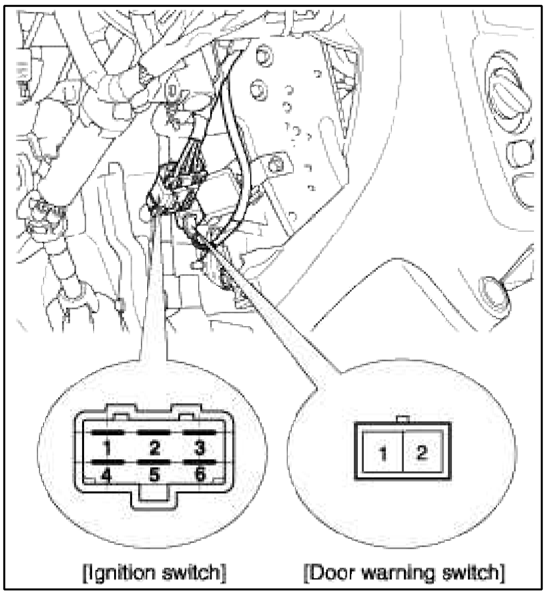
8. Remove the key lock assembly from the steering column shaft. (see ST group)
9. Installation is the reverse of removal.

INSPECTION

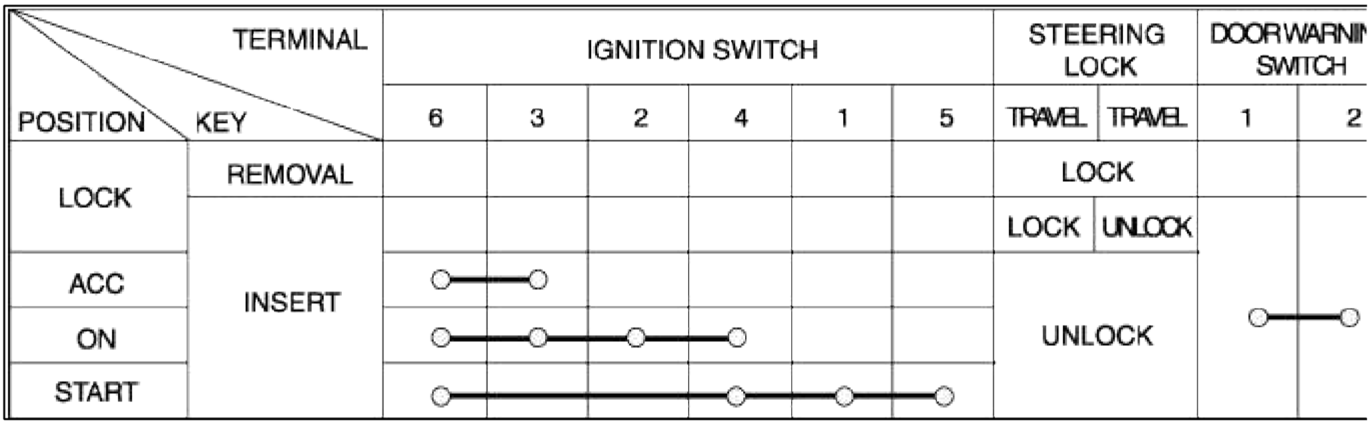
1. Remove the driver's side crash pad lower panel.



2. Disconnect the ignition switch connector and the door warning switch connector under the steering column.


1 2 3
4 5 6
1 2
[Ignition switch]
[Door warning switch]

3. Check for continuity between the terminals.
4. If continuity is not as specified, replace the switch.



POSITION	TERMINAL KEY	IGNITION SWITCH						STEERING LOCK		DOOR WARNIN SWITCH	
		6	3	2	4	1	5	TRAVEL	TRAVEL	1	2
LOCK	REMOVAL							LOCK			
	INSERT							LOCK	UNLOCK	○	○
ACC		○	○					UNLOCK			
ON		○	○	○	○						
START		○			○	○	○				

ACCENT(LC) > 2005 > G 1.5 SOHC > Brake System

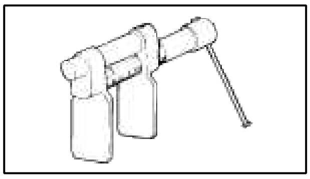
Brake System > General Information > General Safety Information and Caution

PRECAUTION

- Care must be taken to replace each part properly as it could affect the performance of the brake system and result in a driving hazard. Replace the parts with parts of the same part number or equivalent.
- It is very important to keep parts and the area clean when repairing the brake system.

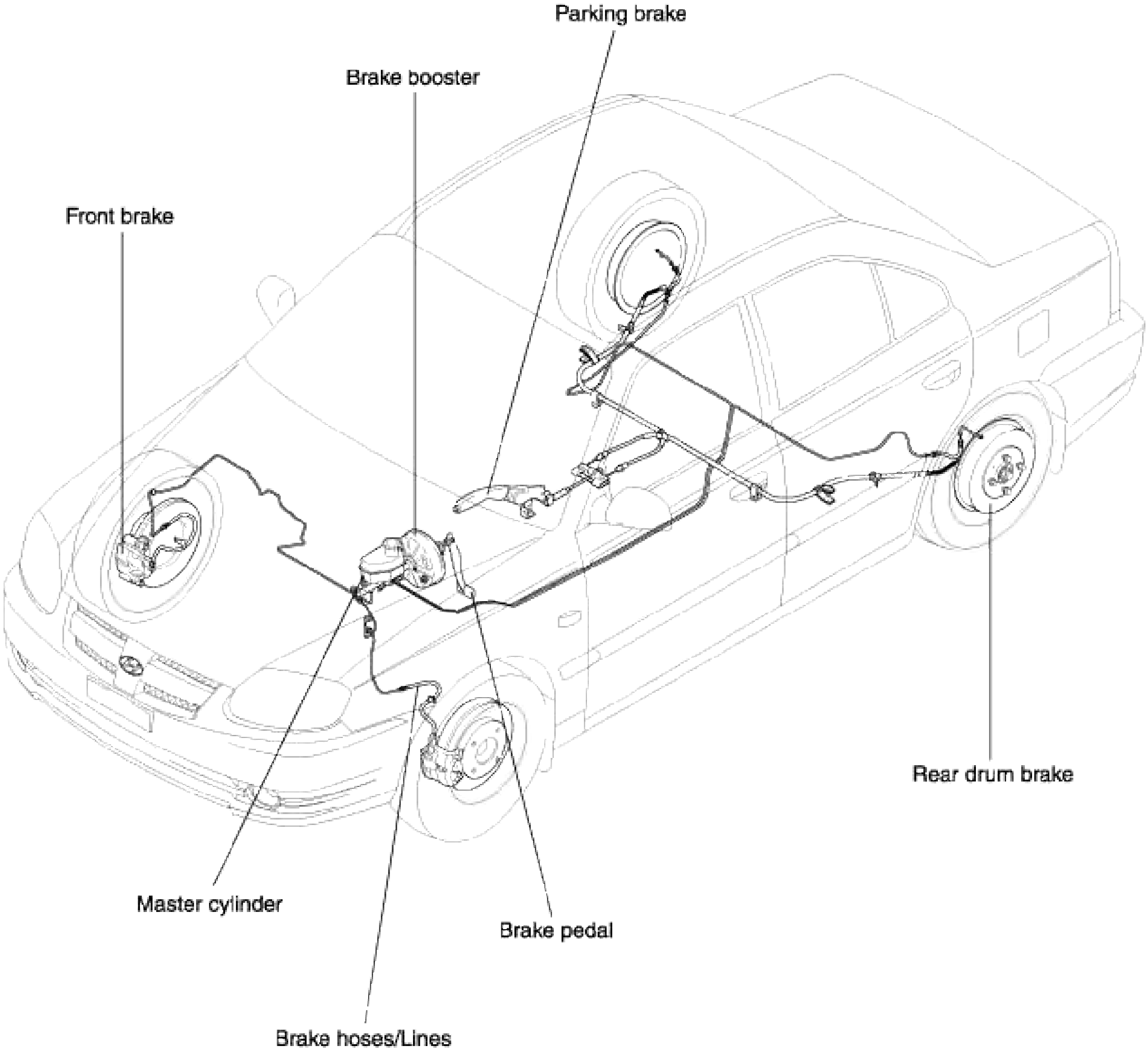
Brake System > General Information > Special Service Tools

SPECIAL TOOLS

TOOL(Number and name)	ILLUSTRATION	USE
09581 ~ 11000 Piston expander		Spreading the front disc brake piston.

Brake System > General Information > Components and Components Location

Component Locating


Parking brake
Brake booster
Front brake
Rear drum brake
Master cylinder
Brake pedal
Brake hoses/Lines

Brake System > General Information > Troubleshooting

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

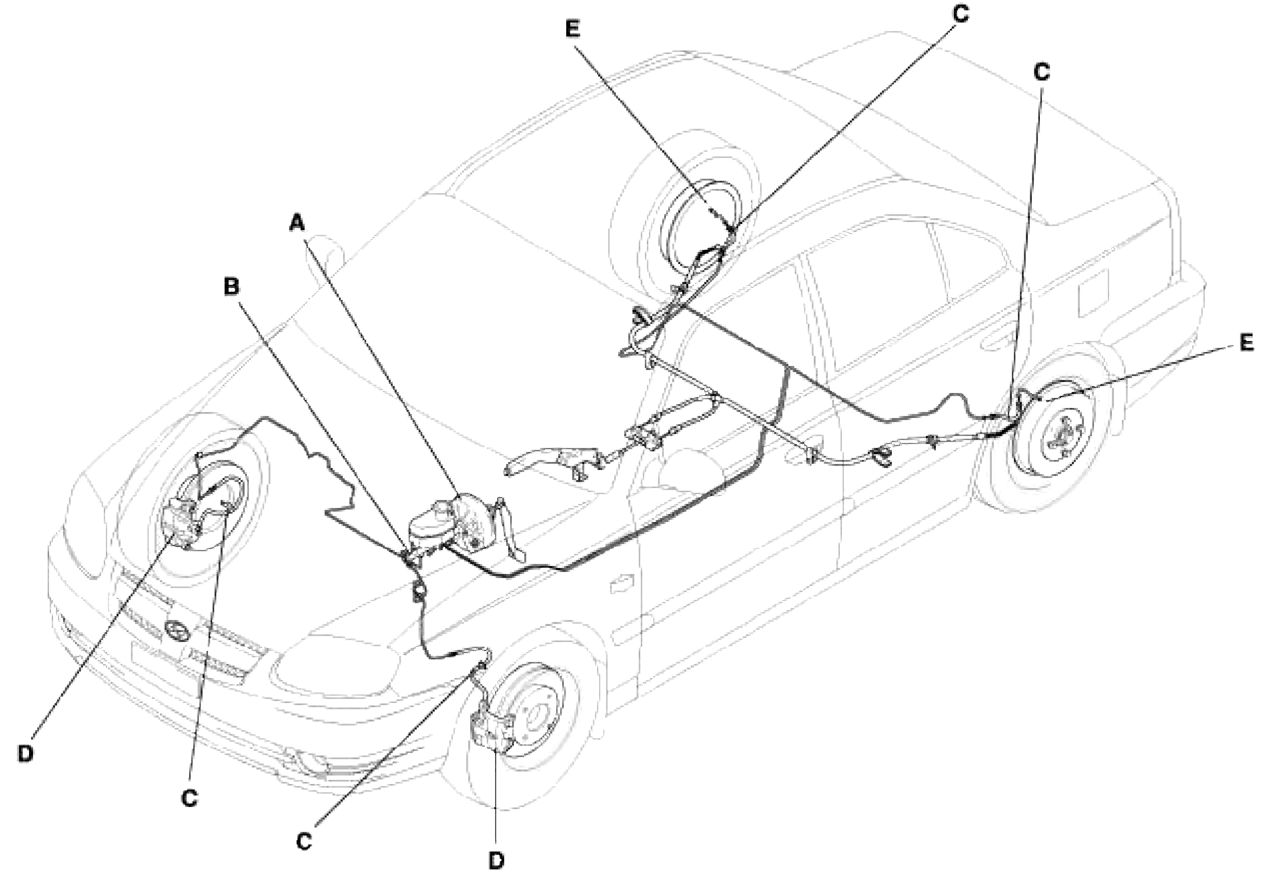
Symptom	Suspect Area	Remedy
Lower pedal or spongy pedal	1. Brake system (Fluid leaks) 2. Brake system (Air in) 3. Piston seals (Worn or damaged) 4. Rear brake shoe clearance (Out of adjustment) 5. Master cylinder (Faulty)	Correct Bleeding Replace Adjust Replace
Brake drag	1. Brake pedal freeplay (Minimal) 2. Parking brake lever travel (Out of adjustment) 3. Parking brake wire (Sticking) 4. Rear brake shoe clearance (Out of adjustment) 5. Pad or lining (Cracked or distorted) 6. Piston (Stuck) 7. Piston (Frozen) 8. Return spring (Faulty) 9. Booster system (Vacuum leaks) 10. Master cylinder (Faulty)	Adjust Adjust Correct Adjust Replace Replace Replace Replace Replace Replace
Brake pull	1. Pad or lining (Oily) 2. Piston (Frozen) 3. Disc (Scored) 4. Pad or lining (Cracked or distorted)	Replace Replace Replace Replace
Hard pedal but brake inefficient	1. Brake system (Fluid leaks) 2. Brake system (Air in) 3. Pad or lining (Worn) 4. Pad or lining (Cracked or distorted) 5. Rear brake shoe clearance (Out of adjustment) 6. Pad or lining (Oily) 7. Pad or lining (Glazed) 8. Disc (Scored) 9. Booster system (Vacuum leaks)	Correct Bleeding Replace Replace Adjust Replace Replace Replace Replace
Noise from brake	1. Pad or lining (Cracked or distorted) 2. Installation bolt (Loosen) 3. Disc (Scored) 4. Pad retainers (Loosen) 5. Sliding pin (Worn) 6. Pad or lining (Dirty) 7. Pad or lining (Glazed) 8. Return spring (Faulty) 9. Brake pad shim (Damage) 10. Shoe hold-down spring (Damage)	Replace Retighten Replace Replace Replace Clearing Replace Replace Replace Replace

Brake System > General Information > All Scheduled Maintenance Instructions

Operation and Leakage Check

Check all of the following items:

Component	Procedure
Brake Booster (A)	Check brake operation by applying the brakes during a test drive. If the brakes do not work properly, check the brake booster. Replace the brake booster as an assembly if it does not work properly or if there are signs of leakage.
Piston cup and pressure cup inspection (B)	• Check brake operation by applying the brakes. Look for damage or signs of fluid leakage. Replace the master cylinder as an assembly if the pedal does not work properly or if there is damage or signs of fluid leakage. • Check for a difference in brake pedal stroke between quick and slow brake applications. Replace the master cylinder if there is a difference in pedal stroke.
Brake hoses (C)	Look for damage or signs of fluid leakage. Replace the brake hose with a new one if it isdamaged or leaking.
Caliper piston seal and piston boots (D)	Check brake operation by applying the brakes. Look for damage or signs of fluid leakage. If the pedal does not work properly, the brakes drag, or there is damage or signs of fluid leakage, disassemble and inspect the brake caliper. Replace the boots and seals with new ones whenever the brake caliper is disassembled.
Wheel cylinder piston cup and dust cover (E)	Check brake operation by applying the brakes. Look for damage or signs of fluid leakage. If the pedal does not work properly, the brakes drag, or there is damage or signs of fluid leakage, replace the wheel cylinder.

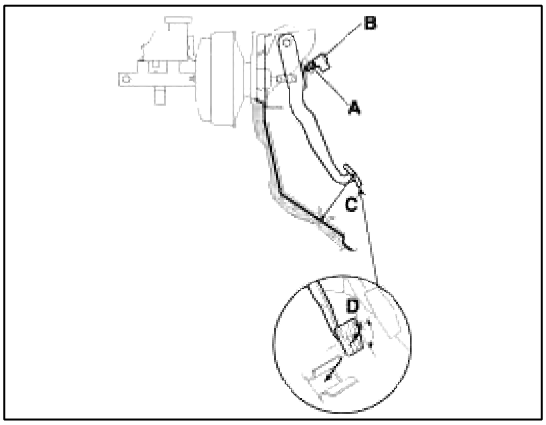


Brake Pedal and Brake Switch Adjustment

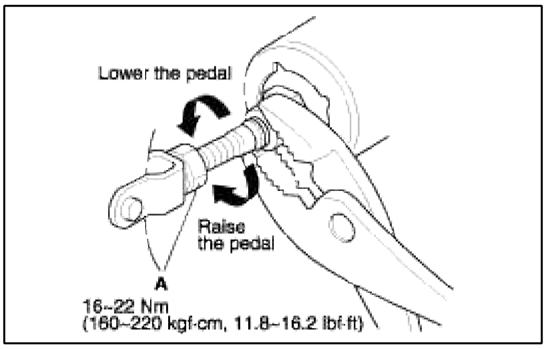
Pedal Height

1. Disconnect the brake switch connector, loosen the brake switch locknut (A), and back off the brake switch (B) until it is no longer touching the brake pedal.
2. Lift up the carpet. At the insulator cutout, measure the pedal height (C) from the middle of the left-side center of the pedal pad (D).

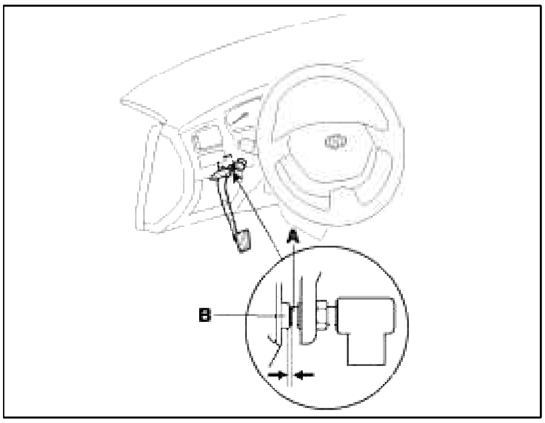
157.1 (+5, 0) mm [6.19 (+0.2, 0) in.]



3. Loosen the pushrod locknut (A), and screw the pushrod in or out with pliers until the standard pedal height from the floor is reached. After adjustment, tighten the locknut firmly. Do not adjust the pedal height with the pushrod depressed.



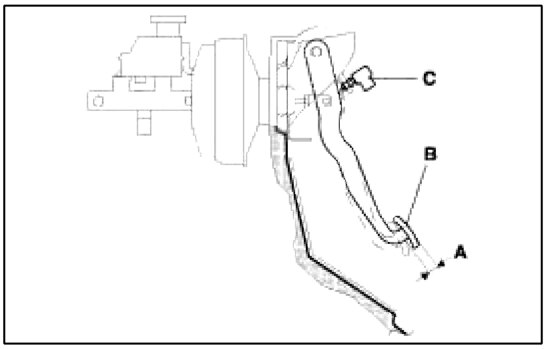
BRAKE SWITCH CLEARANCE



Pedal Free Play

1. With the engine off, inspect the pedal free play (A) on the pedal pad (B) by pushing the pedal by hand.

3~8 mm (0.11~0.31in.)



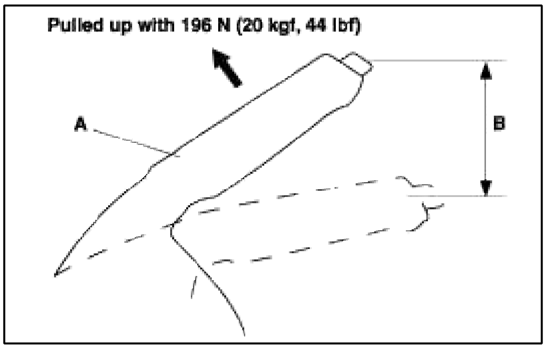
2. If the pedal free play is out of specification, adjust the brake switch (C). If the pedal free play is insufficient, it may result in brake drag.

Parking brake check and adjustment

CHECK

1. Pull the parking brake lever (A) with 196 N (20 kgf, 44lbf) force to fully apply the parking brake. The parking brake lever should be locked within the specified number of clicks (B)

Lever locked clicks: 6~7 clicks



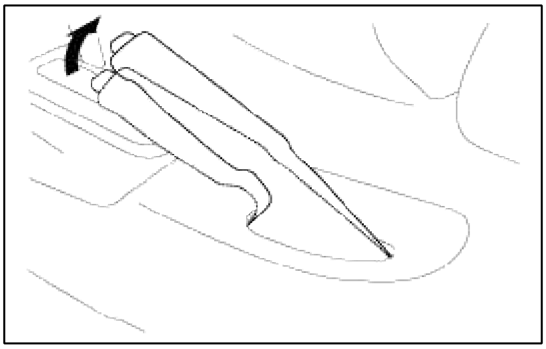
2. Adjust the parking brake if the lever clicks are out of specification.

ADJUSTMENT

NOTE

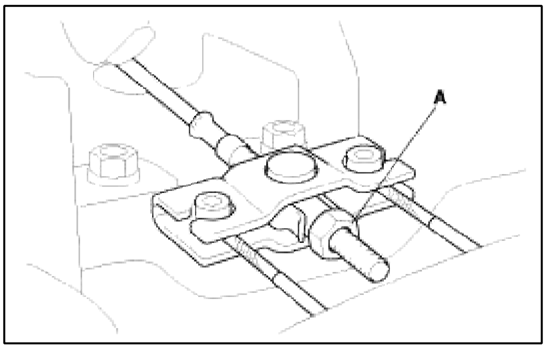
After rear brake caliper servicing, loosen the parking brake adjusting nut, start the engine and depress the brake pedal several times to set the self-adjusting brake before adjusting the parking brake.

1. Block the front wheels, then raise the rear of the vehicle and make sure it is securely supported.
2. Pull the parking brake lever up one click.



3. Remove the console.

4. Tighten the adjusting nut (A) until the parking brakes drag slightly when the rear wheels are turned.



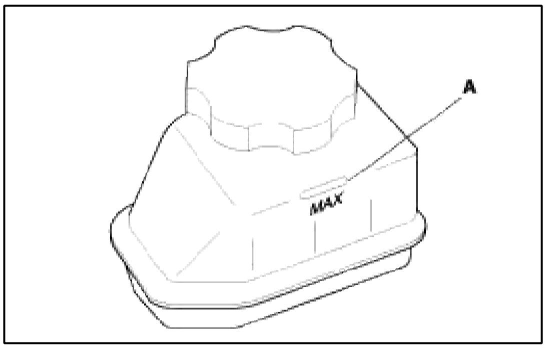
5. Release the parking brake lever fully, and check that parking brakes do not drag when the rear wheels are turned. Readjust if necessary.
6. Make sure that the parking brakes are fully applied when the parking brake lever is pulled up fully.
7. Reinstall the console.

Brake System Bleeding

NOTE

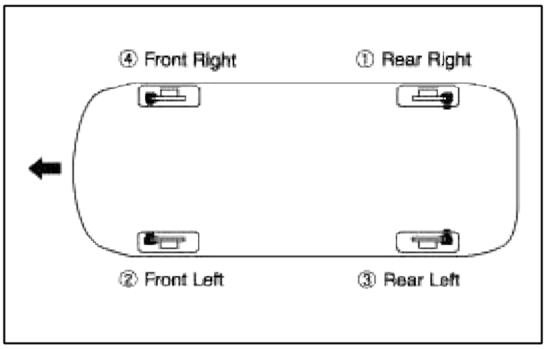
- Do not reuse the drained fluid.
- Always use Genuine DOT 3 or DOT 4 Brake Fluid. Using a non-Genuine DOT3 or DOT 4 brake fluid can cause corrosion and decrease the life of the system.
- Make sure no dirt of other foreign matter is allowed to contaminate the brake fluid.
- Do not spill brake fluid on the vehicle, it may damage the paint; if brake fluid does contact the paint, wash it off immediately with water.
- The reservoir on the master cylinder must be at the MAX (upper) level mark at the start of bleeding procedure and checked after bleeding each brake caliper. Add fluid as required.

1. Make sure the brake fluid level in the reservoir is at the MAX (upper) level line (A).

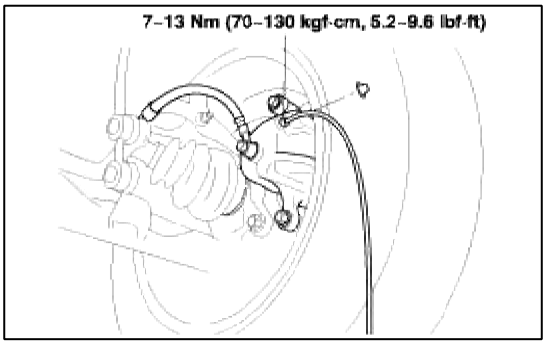


2. Have someone slowly pump the brake pedal several times, then apply steady pressure.
3. Loosen the right-rear brake bleed screw to allow air to escape from the system. Then tighten the bleed screw securely.
4. Repeat the procedure for each wheel in the sequence shown below until air bubbles no longer appear in the fluid.

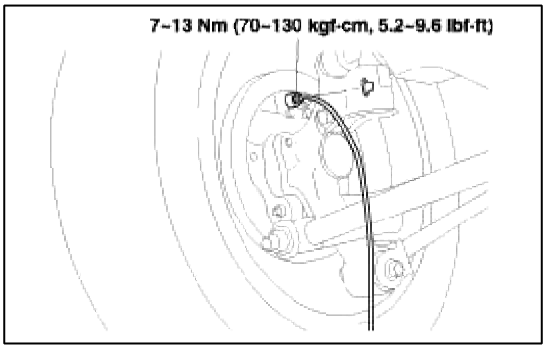
5. Refill the master cylinder reservoir to the MAX (upper) level line.


④ Front Right
① Rear Right
② Front Left
③ Rear Left

Front disc brake:

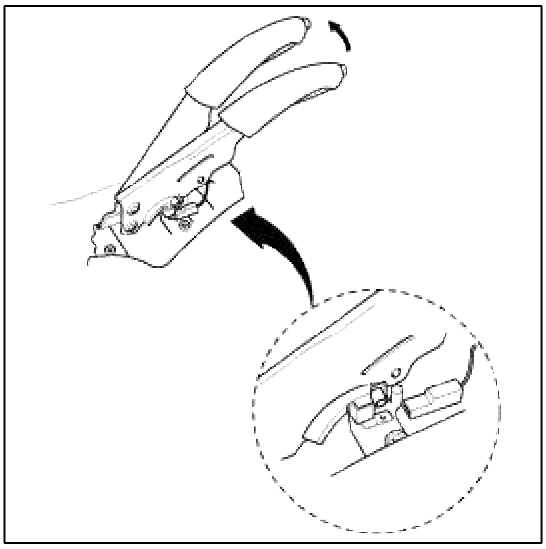

7~13 Nm (70~130 kgf·cm, 5.2~9.6 lbf·ft)

Rear drum brake:


7~13 Nm (70~130 kgf·cm, 5.2~9.6 lbf·ft)

Parking Brake Switch Test

1. Remove the rear console, and disconnect the connector (A) from the switch (B).



2. Check for continuity between the positive terminal and body ground:
   A. With the brake lever up, there should be continuity.
   B. With the brake lever down, there should be no continuity.

Brake System > General Information > Specifications

SPECIFICATIONS

ITEMS	SPECIFICATIONS
Master cylinder	
Type	Tandem type
I.D. mm (in.)	22.22 (0.875)
Fluid level warning sensor	Provided
Brake booster	
Type	Vacuum type with single booster
Effective dia. mm (in.)	245.9 (9.7)
Boosting ratio	6.0 : 1
Proportioning valve	
Cut-in pressure (Split point)	2.94 MPa (30 kg/cm^2, 427 psi)
Decompression ratio	0.27 : 1
Front brake	
Type	Floating type with ventilated disc
Disc O.D. mm (in.)	241 (9.49)
Disc thickness mm (in.)	19 (0.75)
Pad thickness mm (in.)	9 (0.35)
Cylinder I.D. mm (in.)	54 (2.13)
Rear brake (Drum)	
Type	Leading trailing drum
Drum I.D. mm (in.)	203.2 (8.0)
Wheel cylinder I.D. mm (in.)	17.78 (0.7)
Clearance adjustment	Automatic
Parking brake	
Actuation	Mechanical brake acting on rear wheels
Type	Lever
Cable arrangement	V type
Anti-lock Brake System (ABS)	
HECU (HU+ECU)	
ECU type	Motor, valve relay integrated type
Motor power	Max.150W
Accumulator volume	3.0cc
Inlet valve (Front/Rear) mm (in.)	0.5 (0.019)/0.315 (0.012)
Outlet valve (Front/Rear) mm (in.)	0.56 (0.022)/0.355 (0.014)
Wheel speed sensor	
Output frequency	20 ~ 2,000Hz
Output voltage	Min.130mVp.p
Internal resistance	1,385 ± 110Ω
Tone wheel teeth	44 teeth
Air gap mm (in.)	0.2 ~ 1.1 (0.008 ~ 0.043)
ABS & EBD warning lamp	

Type	Active warning lamp module
Operating voltage	12V
Current	80mA

O.D = Outer Diameter
I.D = Inner Diameter
SERVICE STANDARD

ITEM	STANDARD VALUE	SERVICE LIMIT
Brake pedal height	157.1 (+5,0) mm [6.19 (+0.2, 0) in.]	
Brake pedal stroke	125.6 mm (4.95 in.) or more	
Stop lamp switch outer case to pedal stopper clearance	0.5 ~ 1.0 mm (0.02 ~ 0.04 in.)	
Brake pedal free play	3~8 mm(0.11~0.31in.)	
Booster push rod to master cylinder piston clearance	0 (at 500mmHg vacuum)	
Parking brake lever stroke when lever assembly is pulled with 196N(20kg, 44lb force)	6~7 clicks	
Front disc brake pad thickness	9 mm (0.354 in.)	2 mm (0.0787in.)
Front disc thickness(minimum)	19 mm (0.75 in.)	17 mm (0.67 in)
Front disc abrasion	-	0.05 mm (0.002 in.)
Rear drum brake lining thickness	4.8mm (0.19 in.)	1 mm (0.04 in.)
Rear drum brake drum I.D.(maximum)	180mm (7.09in.)	182 mm(7.17 in.)
Wheel cylinder to piston clearance	-	0.15 mm (0.006 in.)

TIGHTENING TORQUE

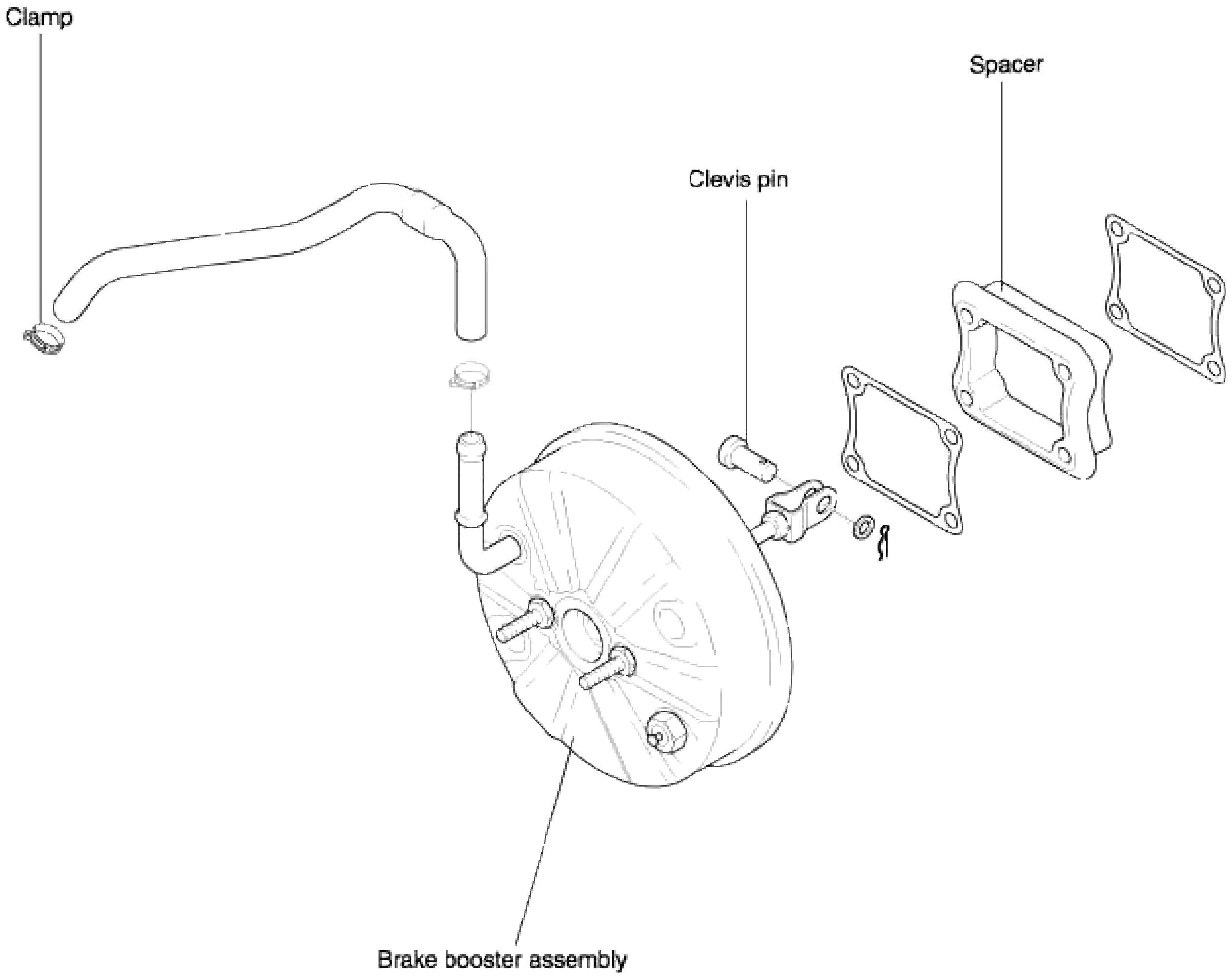
	Nm	kgf·cm	lbf·ft
Master cylinder to booster mounting nut	8 ~ 12	80 ~ 120	5.9 ~ 8.9
Brake booster mounting nut	8 ~ 12	80 ~ 120	5.9 ~ 8.9
Brake booster vacuum hose fitting to surge tank	8 ~ 12	80 ~ 120	5.9 ~ 8.9
Bleeder screw	7 ~ 13	70 ~ 130	5.2 ~ 9.6
Brake tube flare nut, brake hose	13 ~ 17	130 ~ 170	9.6 ~ 12.5
Proportioning valve mounting	35 ~ 55	350 ~ 550	25.8 ~ 33.2
Caliper guide rod bolt	22 ~ 32	220 ~ 320	16.2 ~ 23.6
Caliper pin bolt	35 ~ 45	350 ~ 450	25.8 ~ 33.2
Caliper assembly to knuckle	69 ~ 85	690 ~ 850	50.9 ~ 62.7
Brake hose to front caliper	25 ~ 30	250 ~ 300	18.4 ~ 22.1
Brake tube mounting nut	13 ~ 17	130 ~ 170	9.6 ~ 12.5
HECU mounting bolt	8 ~ 10	80 ~ 100	6 ~ 7.3
Wheel sensor mounting bolt	8 ~ 10	80 ~ 100	6 ~ 7.3

CAUTION

Replace self-locking nuts with new ones after removal.

Brake System > Brake System > Brake Booster > Components and Components Location

COMPONENTS


Clamp
Spacer
Clevis pin
Brake booster assembly

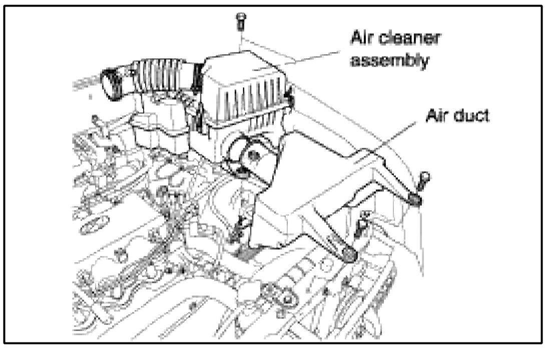
Brake System > Brake System > Brake Booster > Repair procedures

REMOVAL

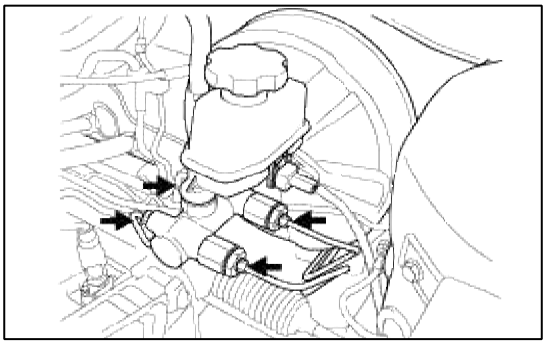
CAUTION

- Be careful not to bend or damage the brake lines when removing the master cylinder.
- Do not spill brake fluid on the vehicle; it may damage the paint; if brake fluid does contact the paint, wash it off immediately with water.
- To prevent spills, cover the hose joints with rags or shop towels.

1. Remove the air cleaner and the air duct.



2. Remove the brake fluid level switch connector.

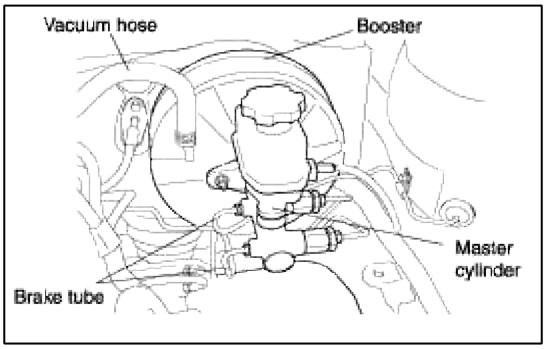


3. After removing the brake reservoir cap, suck out the brake fluid in the reservoir using a syringe or equivalent.
4. Disconnect the brake tube from the master cylinder.

CAUTION

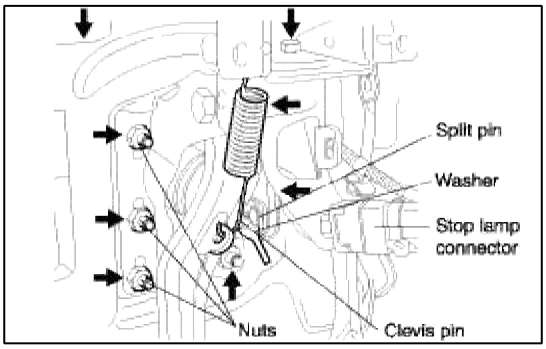
Take care not to contaminate the brake fluid.

5. Remove the master cylinder from the brake booster.
6. Remove the vacuum hose from the booster.



7. Remove the push rod from the brake pedal.

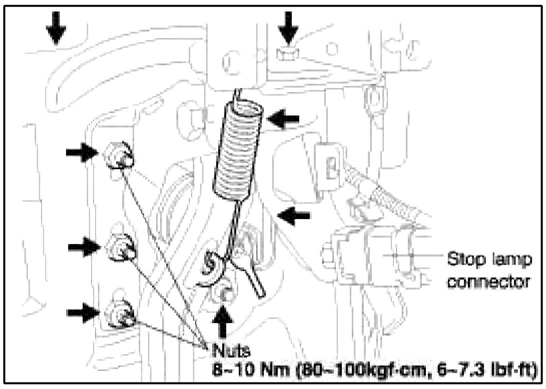
8. Remove the booster mounting nuts.


Split pin
Washer
Stop lamp connector
Nuts
Clevis pin

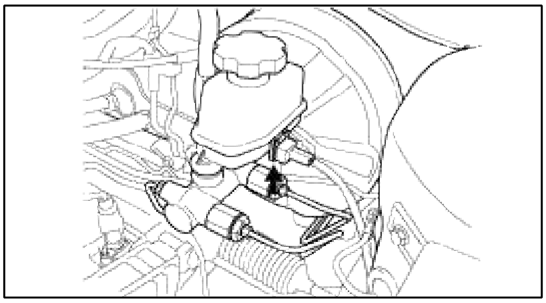
INSTALLATION

1. Install the brake booster and tighten the mounting nut.

Tightening torque Nm (kgf·cm, lbf·ft)
Brake booster mounting nut: 8~10 (80~100, 6~7.3)


Stop lamp connector
Nuts
8~10 Nm (80~100kgf·cm, 6~7.3 lbf·ft)

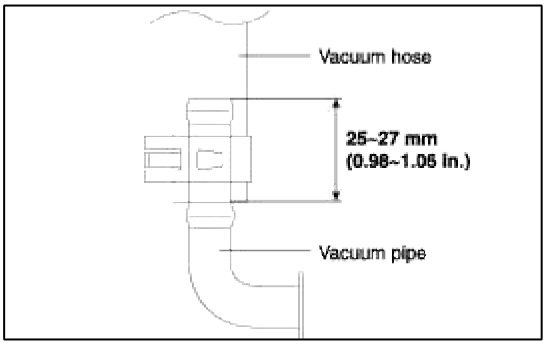
2. Apply grease to the contact points of the brake pedal and the push rod.
3. Connect the brake pedal and the clevis with a clevis pin and install the split pin to the clevis pin.
4. After installing the master cylinder, install the brake tube to the master cylinder.



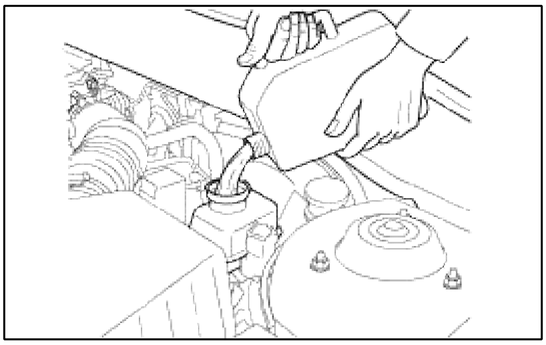
5. Connect the vacuum hose to the brake booster.

CAUTION

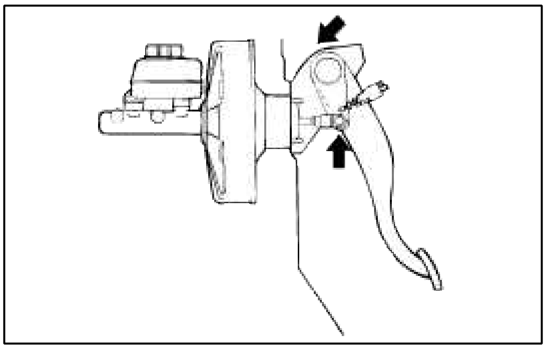
- Make sure that there are no bend, twist, or leaks in the vacuum hose.
- When installing the vacuum hose to the vacuum pipe, the vacuum pipe should be inserted to the depth of 25~27mm (0.98~1.06 in.) as shown in the illustration.



6. Fill the brake reservoir with brake fluid, and bleed the system.



7. Check for brake fluid leaks.
8. Inspect and adjust the brake pedal.
9. After installation, apply grease to the contact points of the clevis and brake pedal sufficiently.



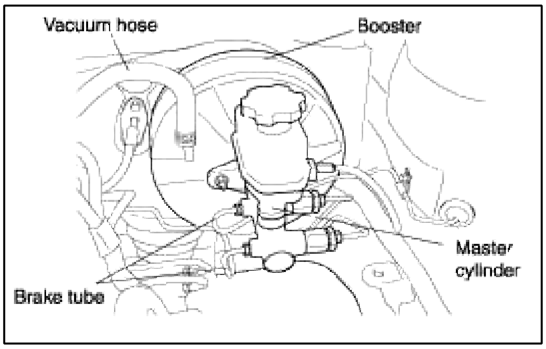
INSPECTION

CHECK VALVE OPERATION CHECK

1. Remove the vacuum hose.

NOTE

The check valve is press-fitted inside the vacuum hose at the position of the marking.

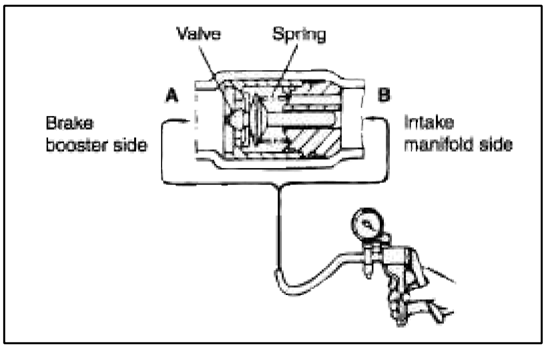

Vacuum hose
Booster
Master cylinder
Brake tube

2. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Accept/Reject criteria
Connection at the brake booster side (A)	A negative pressure (vacuum) is created and held
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created

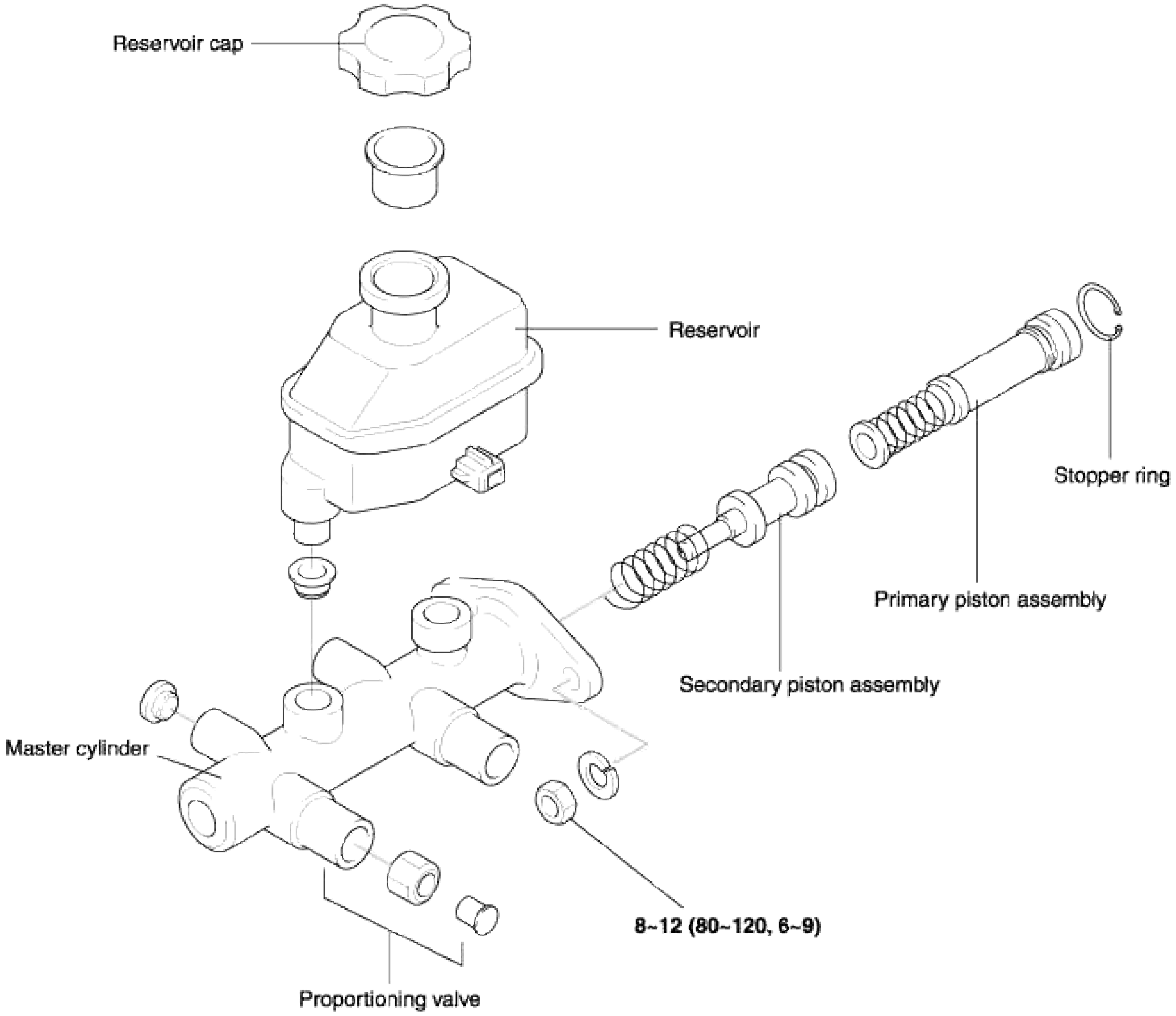
CAUTION

If the check valve is defective, replace it if an assembly unit together with the vacuum hose.


Valve
Spring
A
B
Brake booster side
Intake manifold side

Brake System > Brake System > Master Cylinder > Components and Components Location

COMPONENTS

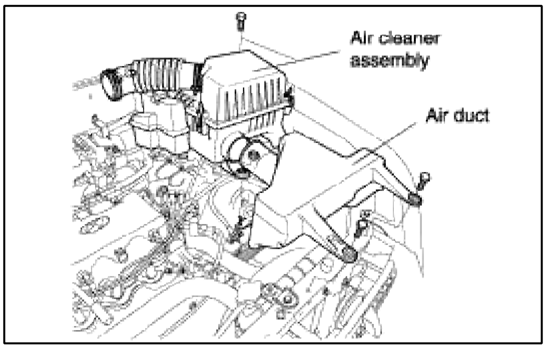

Reservoir cap
Reservoir
Stopper ring
Primary piston assembly
Secondary piston assembly
Master cylinder
8~12 (80~120, 6~9)
Proportioning valve

TORQUE: **Nm (kgf-cm, lbf-ft)**

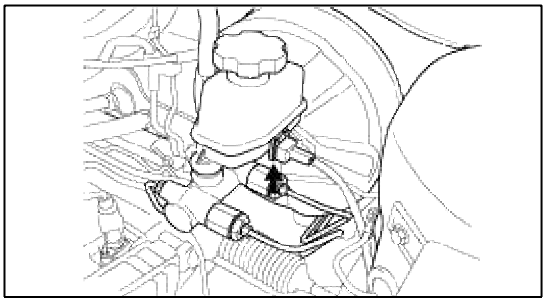
Brake System > Brake System > Master Cylinder > Repair procedures

REMOVAL

1. Remove the air cleaner and the air duct.


Air cleaner assembly
Air duct

2. Remove the brake fluid level switch connector.

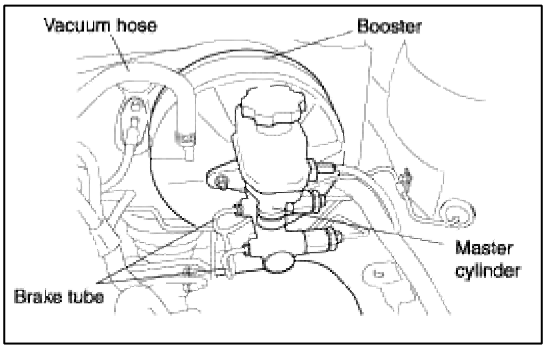


3. Disconnect the brake tube from the master cylinder and install the plug.

CAUTION

- Be careful not to bend or damage the brake lines when removing the master cylinder.
- Do not spill brake fluid on the vehicle; it may damage the paint.
  If brake fluid does contact the paint, wash it off immediately with water.
- To prevent spills, cover the hose joints with rags or shop towels.

4. Remove master cylinder mounting nuts and then lift out the master cylinder.


Vacuum hose
Booster
Master cylinder
Brake tube

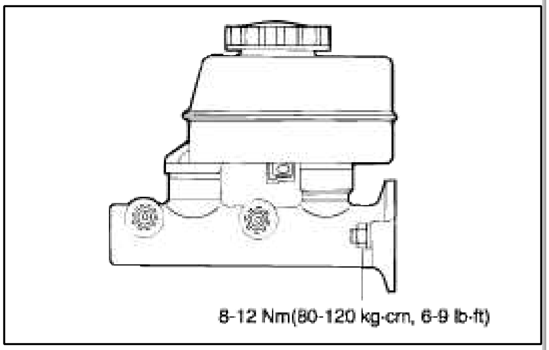
INSTALLATION

1. Install the master cylinder to the brake booster.

2. Connect the brake tubes to the master cylinder.

CAUTION

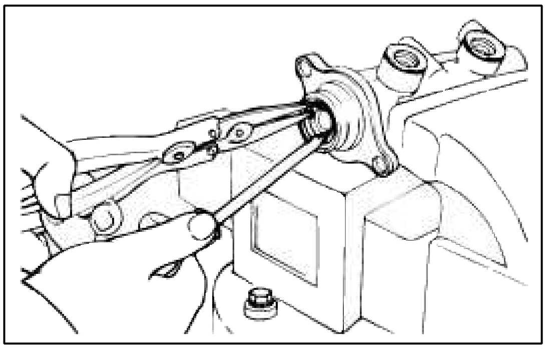
Check the brake tubes for bends and twists.



3. After filling the brake reservoir with brake fluid, bleed the system. (Refer to "Air bleeding in adjustment procedure)

DISASSEMBLY

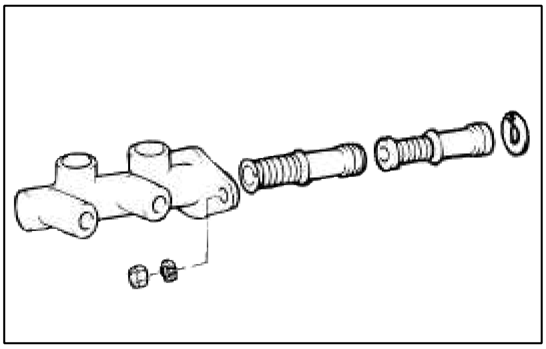
1. Remove the reservoir cap and drain the brake fluid into a suitable container.
2. After disconnecting the mounting screws, pry the reservoir free from the master cylinder.
3. Using snap ring pliers, remove the retainer ring.



4. Remove the primary piston and the secondary piston from the master cylinder body.

NOTE

Do not disassemble the primary and secondary piston assembly.



INSPECTION

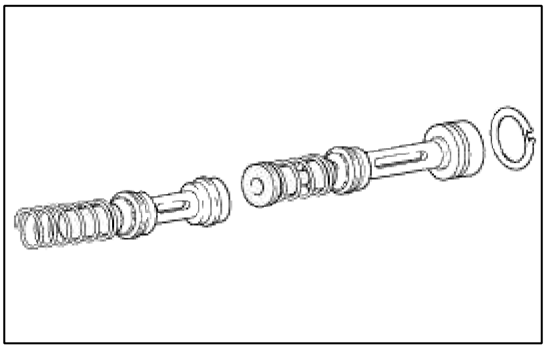
1. Check the master cylinder bore for rust or scoring.

2. Check the master cylinder for wear or damage. If necessary, clean or replace the cylinder.

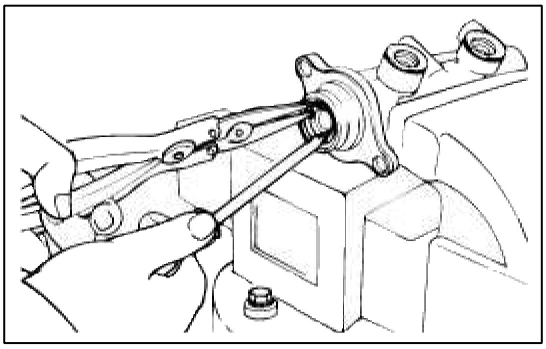
> **NOTE**
>
> 1. If the cylinder bore is damaged, replace the master cylinder assembly.
> 2. Wash the contaminated parts in alchohol.

REASSEMBLY

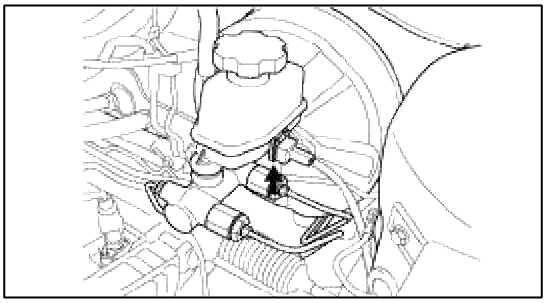
1. Apply genuine brake fluid to the rubber parts of the cylinder kit and grommets.



2. Carefully insert the springs and pistons in the proper direction.
3. Press against the pistons with a screwdriver and install the retainer ring.



4. Mount two grommets.
5. Install the reservoir on the cylinder.



Brake System > Brake System > Proportioning Valve > Description and Operation

DESCRIPTION

Brake System > Brake System > Proportioning Valve > Repair procedures

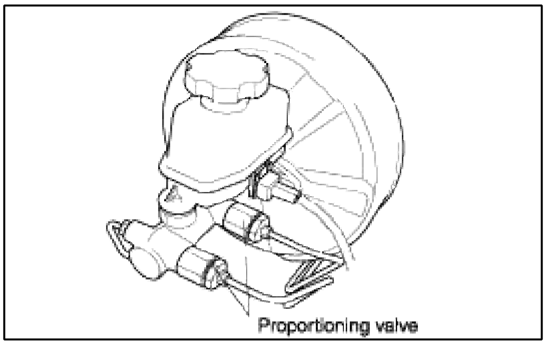
REMOVAL AND INSPECTION

1. Remove the proportioning valve from the master cylinder.

2. Connect two pressure gauges; one to the input side, and one to the output side.

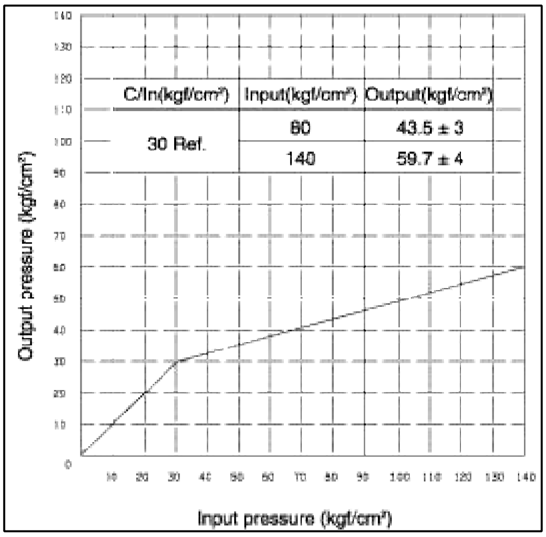
> **NOTE**
>
> Be sure to bleed the system after connecting the pressure gauges.

3. With the brakes applied, measure the input pressure and the output pressure. If the measured pressures are within the specified range, the proportioning valve is good.



4. Reconnect the brake lines in their original positions and bleed the system.

> **NOTE**
>
> This figure shows characteristics of the proportioning valve as the pressure increases.



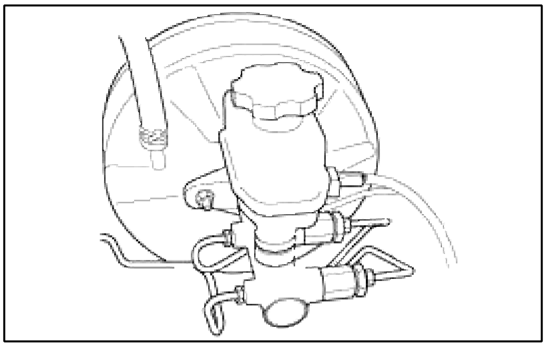
C/In(kgf/cm^2)	Input(kgf/cm^2)	Output(kgf/cm^2)
30 Ref.	80	43.5 ± 3
	140	59.7 ± 4

INSTALLATION

1. Install the propotioning valve to the master cylinder.

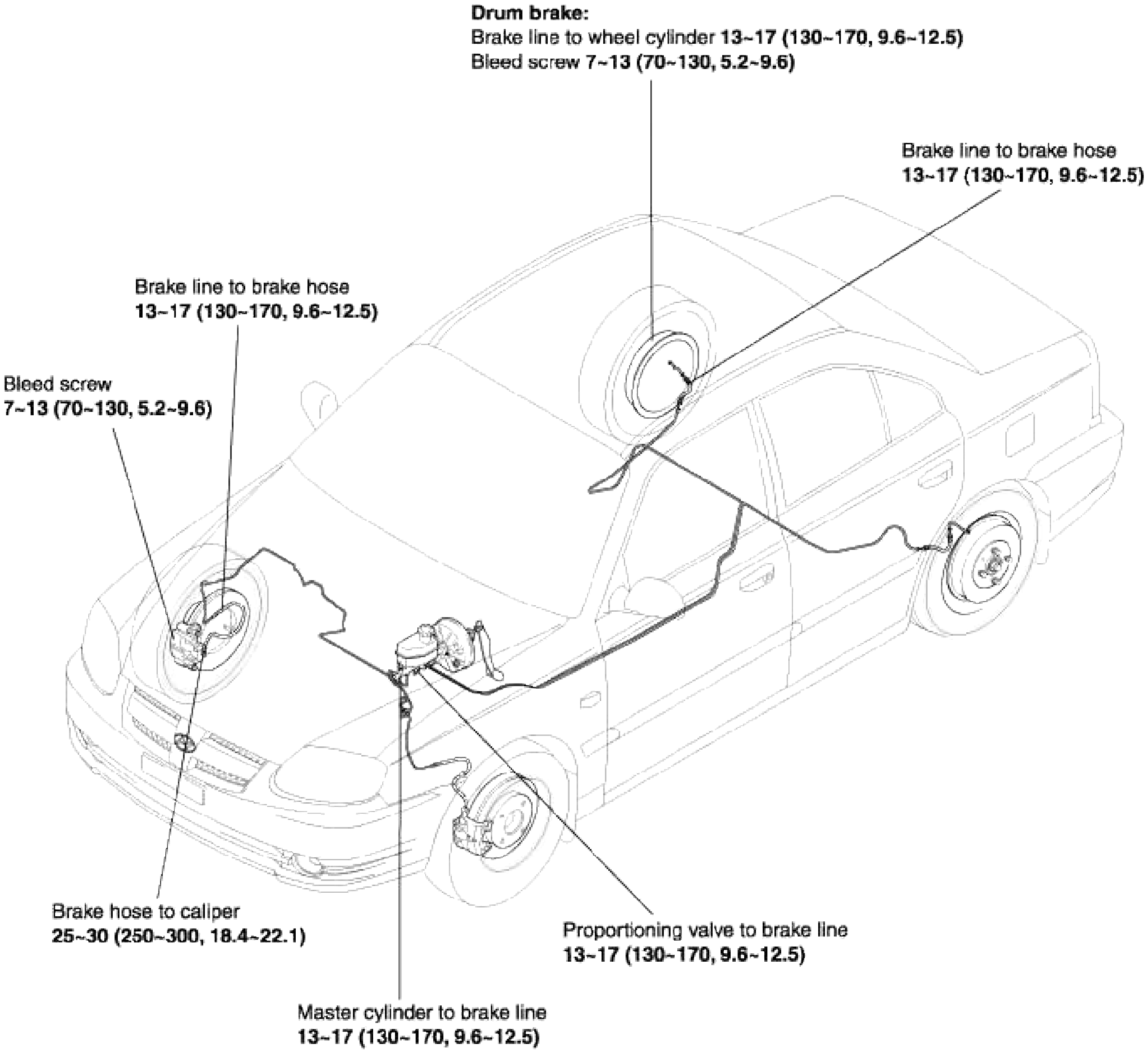
2. Tighten the flare nuts and bleed the system.

Tightening torque
Brake tube flare nut:
13~17 Nm (130~170 kgf·cm, 10~12 lbf·ft)
Proportioning valve mounting nut:
35~55 Nm (350~550 kgf·cm, 26~41 lbf·ft)



Brake System > Brake System > Brake Line > Components and Components Location

COMPONENT LOCATION


Drum brake:
Brake line to wheel cylinder **13~17 (130~170, 9.6~12.5)**
Bleed screw **7~13 (70~130, 5.2~9.6)**
Brake line to brake hose
13~17 (130~170, 9.6~12.5)
Brake line to brake hose
13~17 (130~170, 9.6~12.5)
Bleed screw
7~13 (70~130, 5.2~9.6)
Brake hose to caliper
25~30 (250~300, 18.4~22.1)
Proportioning valve to brake line
13~17 (130~170, 9.6~12.5)
Master cylinder to brake line
13~17 (130~170, 9.6~12.5)

TORQUE: **Nm (kgf·cm, lbf·ft)**

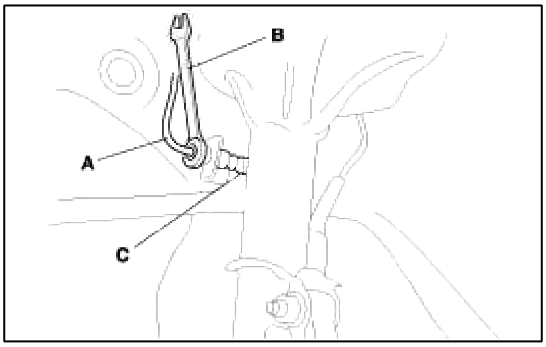
Brake System > Brake System > Brake Line > Repair procedures

Replacement

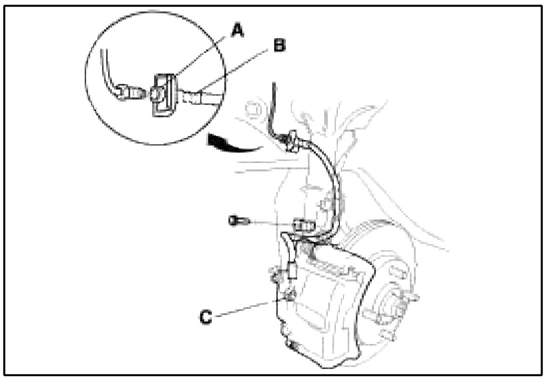
NOTE

- Before reassembling, check that all parts are free of dust and other foreign particles.
- Replace parts with new ones whenever specified to do so.
- Do not spill brake fluid on the vehicle; it may damage the paint; if brake fluid gets on the paint, wash it off immediately with water.

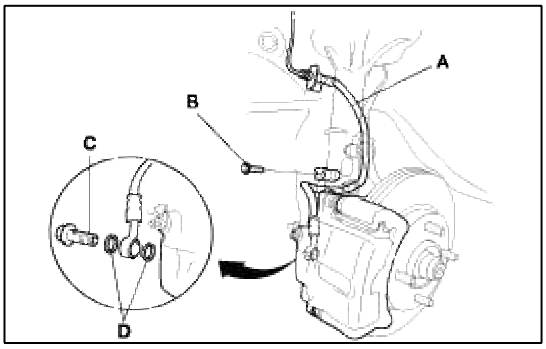
1. Replace the brake hose (A) if the hose is twisted, cracked, or if it leaks.



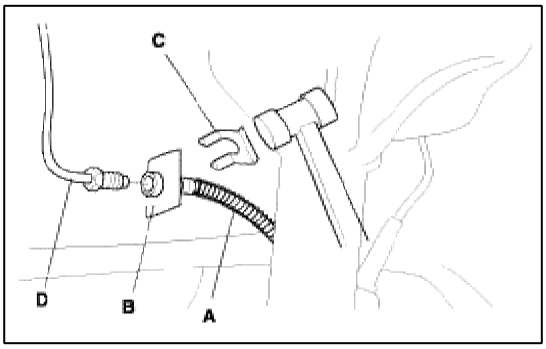
2. Disconnect the brake hose from the brake line (B) using a 10mm flare-nut wrench (C).
3. Remove and discard the brake hose clip (A) from the brake hose (B).



4. Remove the connector bolt (C), and disconnect the brake hose from the caliper.
5. Remove the brake hose from the knuckle.
6. Install the brake hose (A) on the knuckle with 12mm flange bolt (B) first, then connect the brake hose to the caliper with the connector bolt (C) and new sealing washers (D).



7. Install the brake hose (A) on the upper brake hose bracket (B) with a new brake hose clip (C).



8. Connect the brake line (D) to the brake hose

9. After installing the brake hose, bleed the brake system.
10. Perform the following checks.
    A. Check the brake hose and line joint for leaks, and tighten if necessary.
    B. Check the brake hoses for interference and twisting.

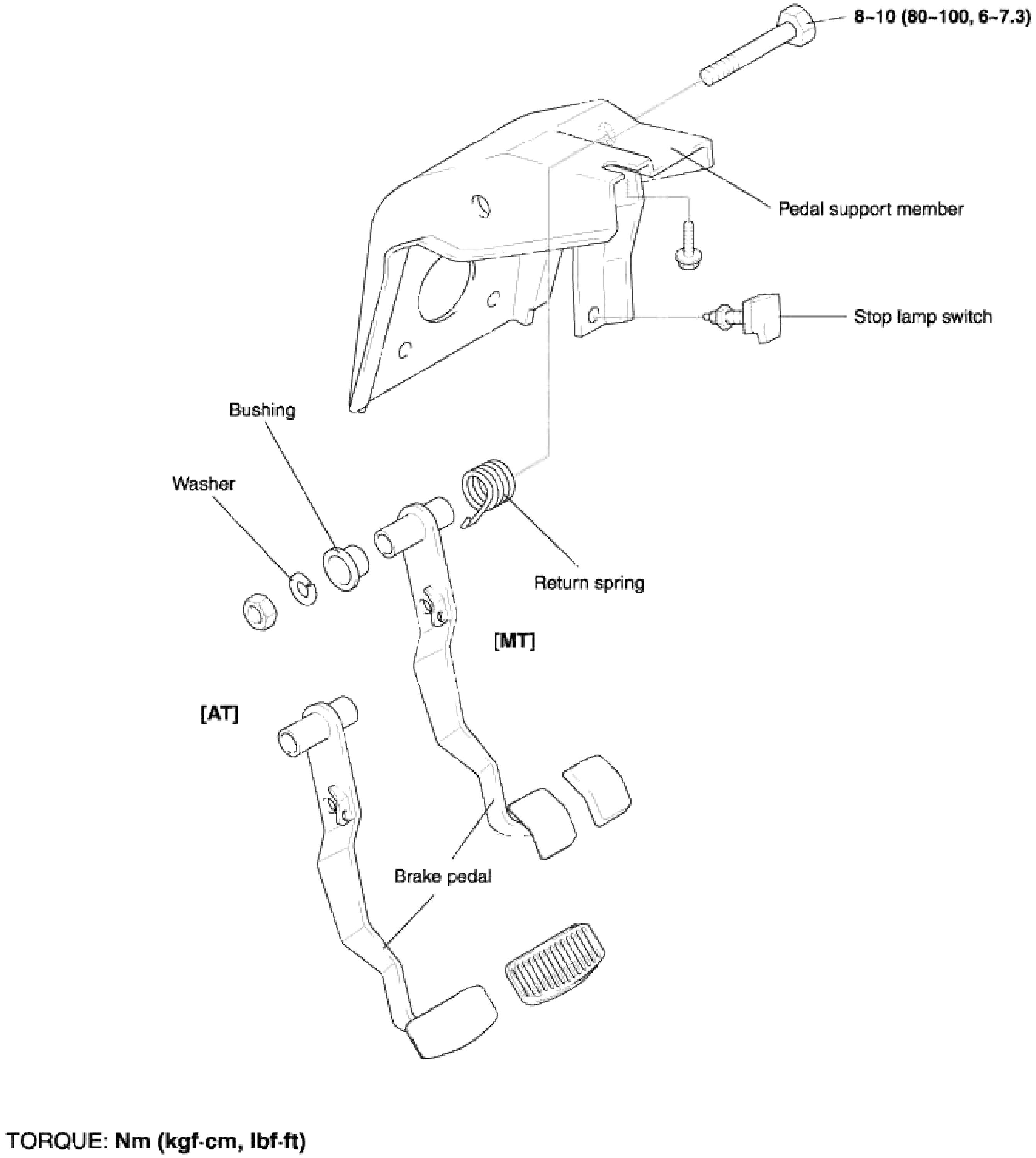
INSPECTION

1. Inspect the brake hoses, for damage, deterioration, leaks, interference and twisting.
2. Check the brake lines for damage, rusting, and leakage. Also check for bent brake lines.
3. Check for leaks at hose and line joints or connections, and retighten if necessary.
4. Check the master cylinder for damage and leakage.

> **NOTE**
>
> Replace the brake hose clip whenever the brake hose is serviced.

Brake System > Brake System > Brake Pedal > Components and Components Location

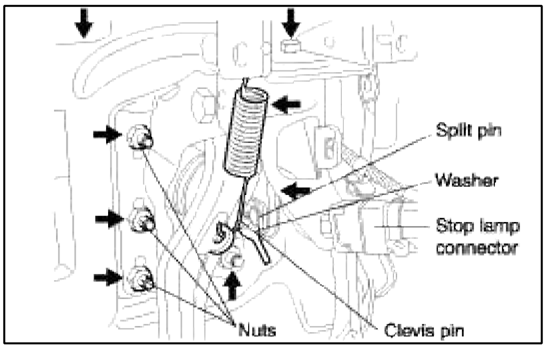
COMPONENTS


8~10 (80~100, 6~7.3)
Pedal support member
Stop lamp switch
Bushing
Washer
Return spring
[MT]
[AT]
Brake pedal
TORQUE: Nm (kgf-cm, lbf-ft)

Brake System > Brake System > Brake Pedal > Repair procedures

REMOVAL

1. Remove the stop lamp switch.

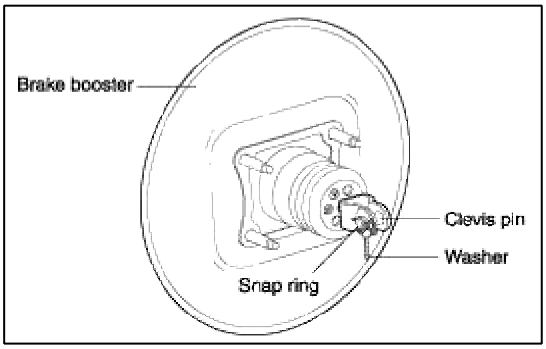

Split pin
Washer
Stop lamp connector
Nuts
Clevis pin

2. Remove the split pin and clevis pin.
3. Remove the brake pedal assembly mounting nut.
4. Remove the brake pedal assembly.

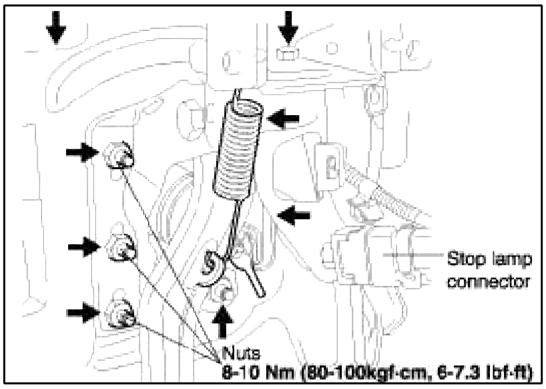
INSTALLATION

1. Installation is the reverse of removal.

> **NOTE**
>
> Be sure to install the split pin on the operating rod clevis pin. Apply the grease (NLGI No.2)


Brake booster
Clevis pin
Washer
Snap ring

2. Install the brake pedal assembly and tighten the flange nuts (booster mounting nuts) and bolt.

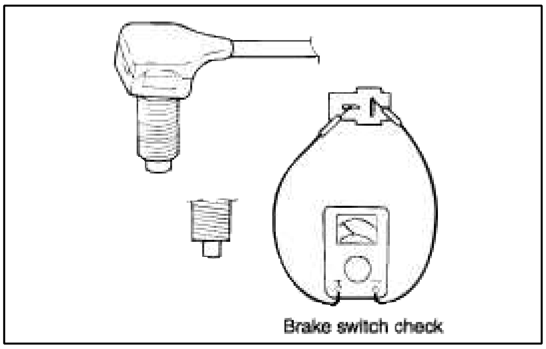

Stop lamp connector
Nuts
8-10 Nm (80-100kgf·cm, 6-7.3 lbf·ft)

3. Install the stop lamp switch.
4. Adjust the brake pedal height and free play.

INSPECTION

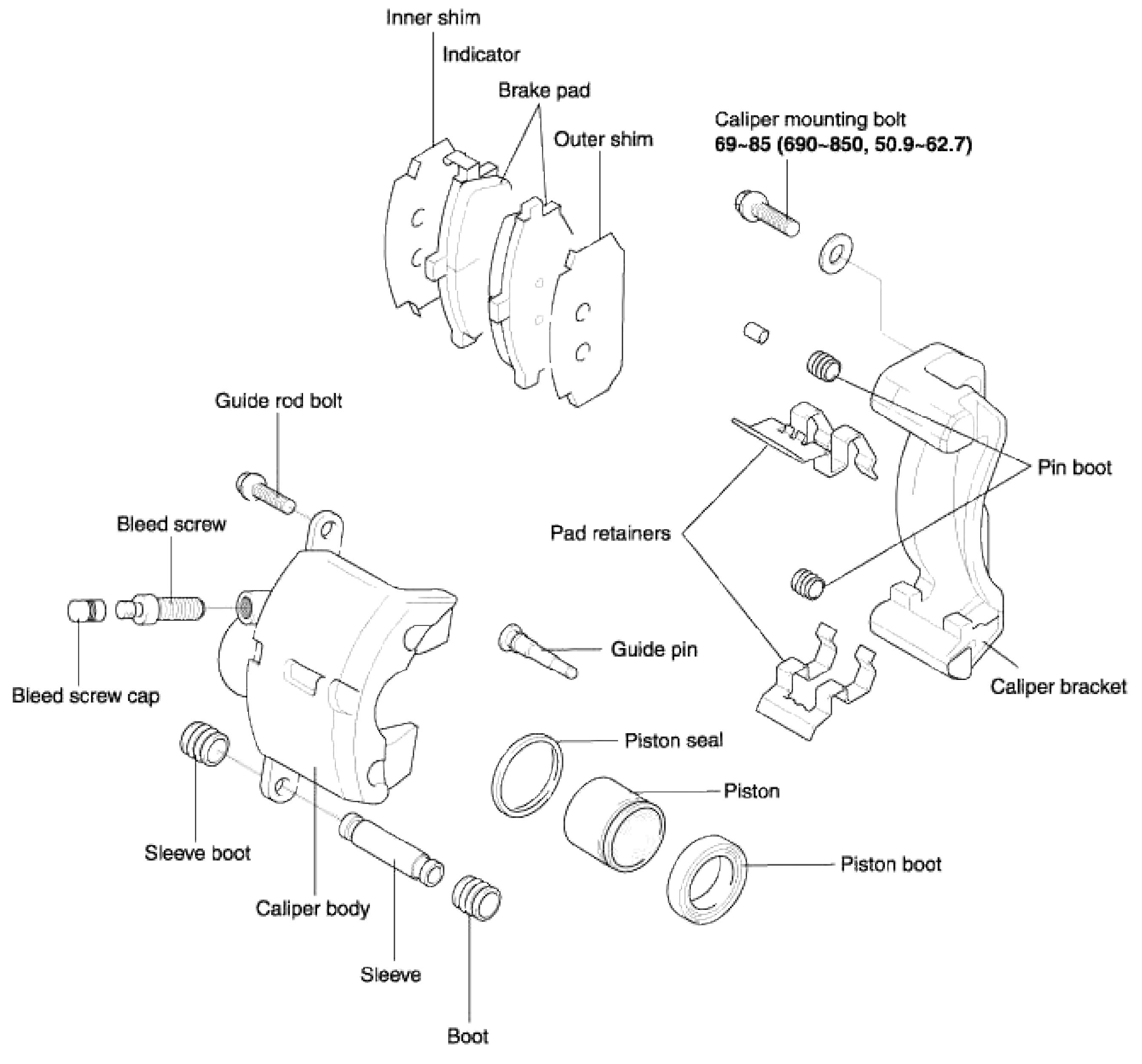
1. Check the bushing for wear.
2. Check the brake pedal for distortion.
3. Check the brake pedal return spring for damage.

4. Check the stop lamp switch.
   (1) With an ohmmeter connected to the stop lamp switch terminals, check for continuity.
   (2) If there is no continuity when the plunger is depressed and there is continuity when the plunger is released, the stop lamp switch is normal.



Brake System > Brake System > Front Disc Brake > Components and Components Location

COMPONENTS


Inner shim
Indicator
Brake pad
Outer shim
Caliper mounting bolt
69~85 (690~850, 50.9~62.7)
Guide rod bolt
Bleed screw
Bleed screw cap
Pad retainers
Pin boot
Guide pin
Caliper bracket
Piston seal
Piston
Piston boot
Sleeve boot
Caliper body
Sleeve
Boot

TORQUE: **Nm (kgf·cm, lbf·ft)**

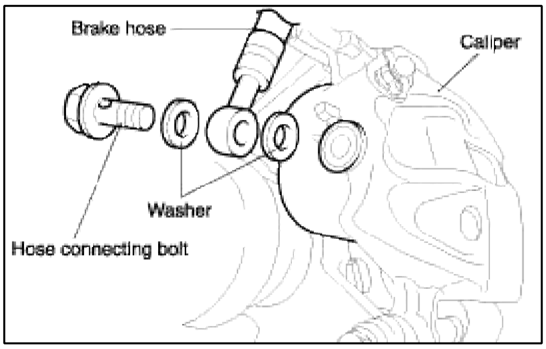
Brake System > Brake System > Front Disc Brake > Repair procedures

REMOVAL

CALIPER ASSEMBLY

1. Remove the wheel and tire.

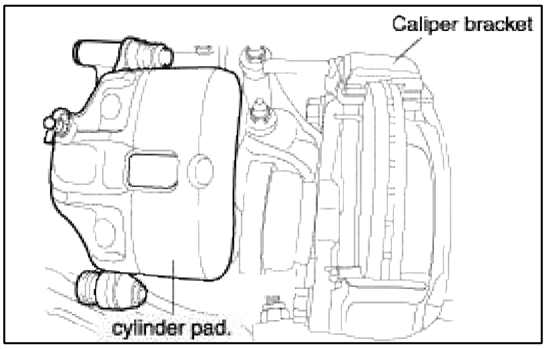
2. Disconnect the brake hose.


Brake hose
Caliper
Washer
Hose connecting bolt

CAUTION

- Do not brake fluid on the vehicle; it may damage the paint.
  If brake fluid does contact the paint, wash it off immediately with water.
- To prevent spills, plug the hose inlets with rags or shop towels.

3. Remove the cylinder mounting bolt.
4. Remove cylinder and pads from the caliper bracket.

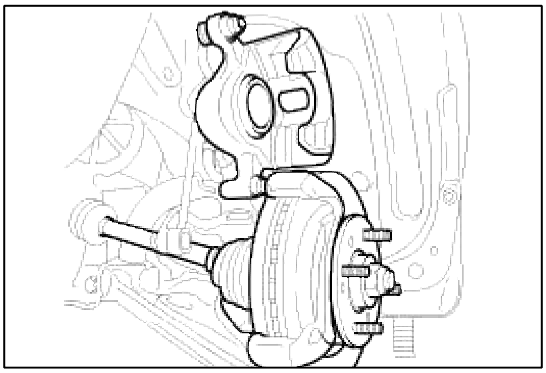

Caliper bracket
cylinder pad.

5. Remove the caliper mounting bolts from the knuckle.
6. Remove the caliper mounting bracket.

REPLACEMENT

REMOVAL

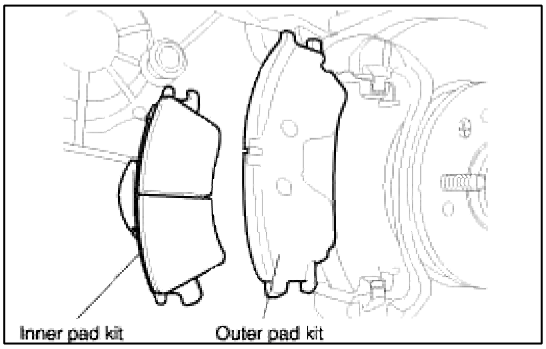
1. Remove the lower bolt and lift the caliper assembly up and secure it with a wire or some other retaining method.



2. Remove the pads.

CAUTION

Do not depress the brake pedal while disassembling the pads.



INSPECTION

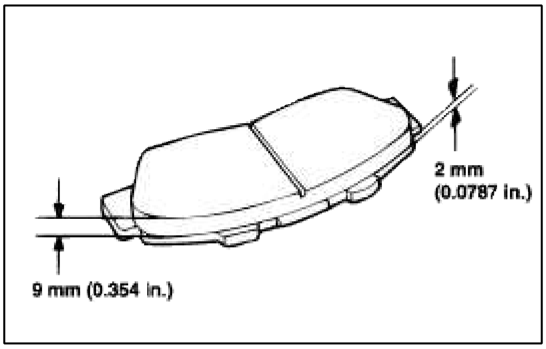
1. Check the pads for wear or oil contamination and replace, if necessary.

CAUTION

- The pads for the right and left wheels should be replaced at the same time. Never "drop" or intermix brake pad sets.
- All four pads must be replaced as a complete set.
- When replacing the brake pad, check for deformation. When replacing the guide spring, use a new one or the used one after cleaning away foreign material.

2. Check the pad for damage or deformation.

Brake pad thickness:
Standard value: 9 mm (0.354 in.)
Service limited value: 2 mm (0.0787 in.)



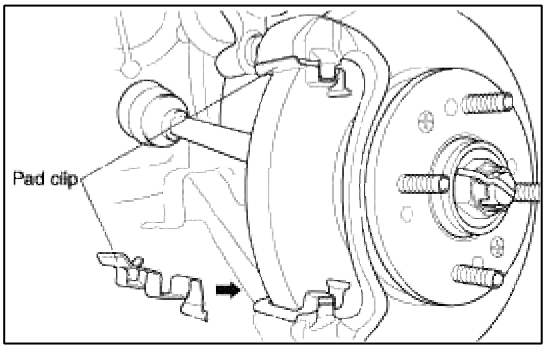
INSTALLATION

1. Install the pad clips.

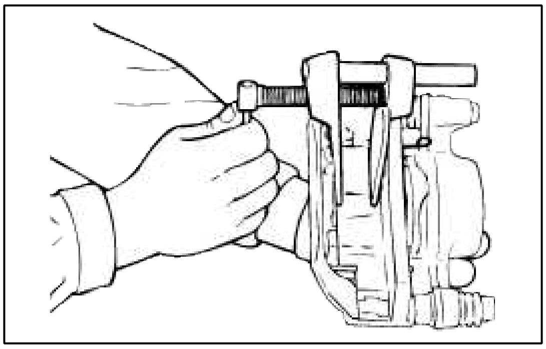
2. Install the pads onto each pad clip.

NOTE

Position the pad with its pad wear indicator upward on the piston side.



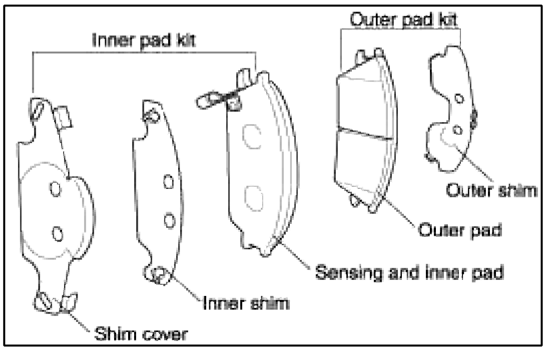
3. Insert the piston in the cylinder using the Special Tool (09581-11000).



4. Install the new pads. The shims are attached to each pad as illustrated.

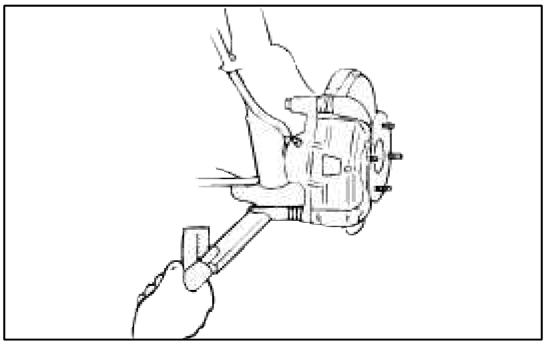
CAUTION

Be careful so that the disc or pad isn't contaminated by grease.


Inner pad kit
Outer pad kit
Outer shim
Outer pad
Sensing and inner pad
Inner shim
Shim cover

5. Install the bolt and tighten to the specified value.

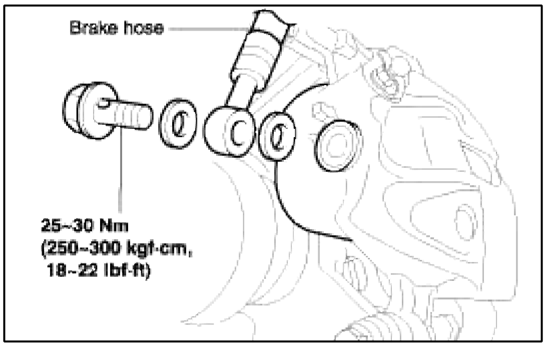
Tightening torque
Guide rod bolt: 22~32 Nm(220~320 kgf·cm, 16~24 lbf·ft)



INSTALLATION

CALIPER ASSEMBLY

1. Be careful not to spill grease or oil on the pad and brake disc contact surface.
2. Tighten the caliper mounting bolt to the specified torque.
3. Install the brake hose.


Brake hose
25~30 Nm
(250~300 kgf·cm,
18~22 lbf·ft)

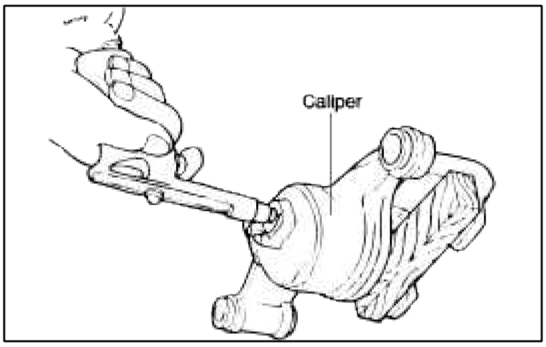
4. Bleed the system.

DISASSEMBLY

1. Remove the piston boot.
2. Remove the piston using compressed air.

NOTE

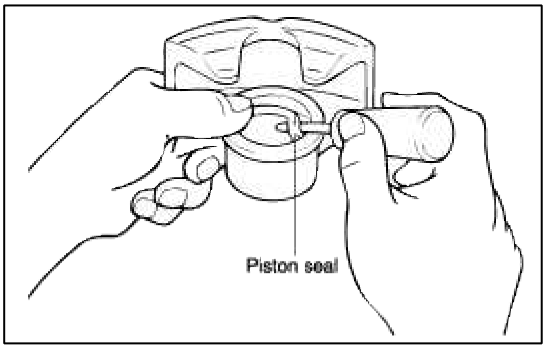
1. Do not put your fingers in front of the piston when using compressed air.
2. Be careful not to splatter the brake fluid.



3. Remove the piston seal from the caliper by using a screwdriver.

CAUTION

Do not damage the piston wall surface.


Piston seal

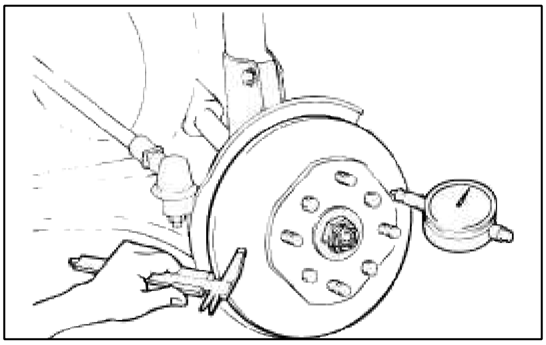
INSPECTION

1. Check the caliper for wear, damage, cracks and dust.
2. Check the piston for dust, damage, cracks and wear on the outer surface.
3. Check the sleeve and pin for damage and dust.
4. Check the pad spring and boots for damage.
5. Check the carrier for damage, dust, wear and cracks.

> **CAUTION**
>
> 1. Do not use sand paper on the piston surface.
> 2. All rubber parts must be replaced with new parts.

6. Inspect the disc by using a caliper and a dial gauge.

Thickness of disc mm (in.)
Standard value: 19 (0.75)
Service limit: 17 (0.67)
0.04 (0.002)
0.01 (0.0004)

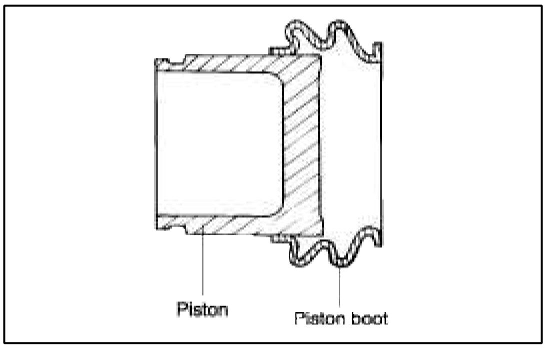


> **NOTE**
>
> 1. Using a micrometer, measure the disc thickness at eight positions approximately 10mm from the outer edge of the disc and at 45° intervals.
>   If you substract the minimum of measurements from the maximum, you get the difference of the disc thickness.
> 2. When measuring the disc runout, fix a dial gauge approximately 5mm from the outer edge of the disc, and rotate the disc 360°.
>   At this time, if you subtract the minimum of measurements from the maximum, you get the disc runout.

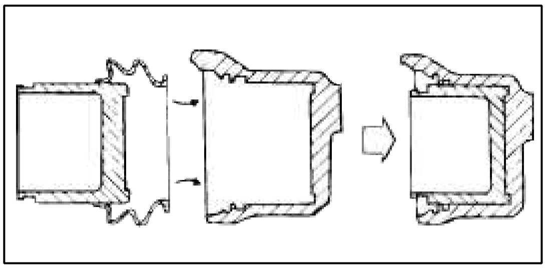
7. If necessary, replace the brake disc.

REASSEMBLY

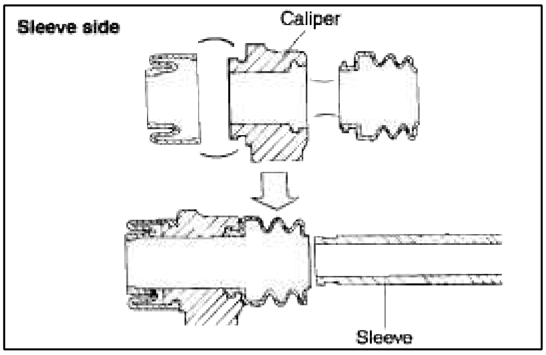
1. Clean all components except the pads and shims with isopropyl alcohol.
2. Apply rubber grease on the piston seal and install the piston seal in the cylinder.

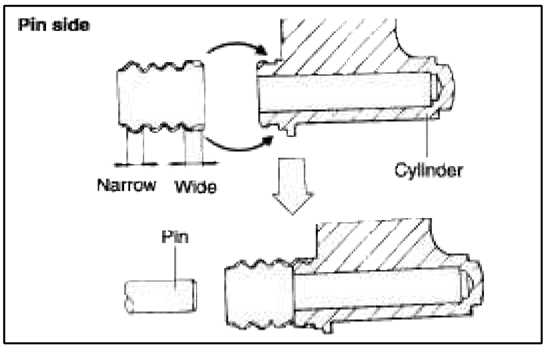


3. Assemble the piston and piston boots according to the following procedure.
    (1) Apply rubber grease to the caliper bore, the outside surface of the piston and the piston boot.
    (2) Install the piston boot on the piston as illustrated.
    (3) Insert the piston boot in the inner groove of the caliper and push the piston into the caliper.



4. Assemble the sliding parts according to the following procedure.
    (1) Apply rubber grease to the outside surface of the sleeve and pin, pin and sleeve bore of the caliper, pin boot and sleeve boot.
    (2) Insert the boot into the groove of the caliper.

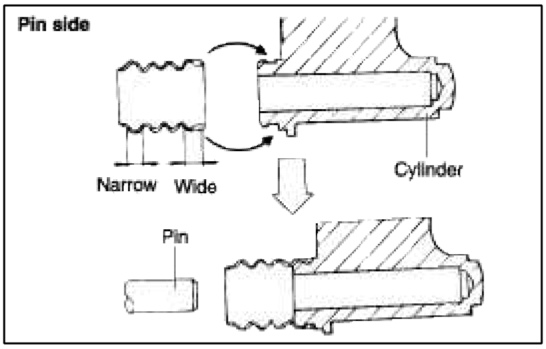

Sleeve side
Caliper
Sleeve


Pin side
Narrow
Wide
Cylinder
Pin

5. Install the pads.

NOTE

Be careful so that the disc or pad is not contaminated by grease.


Pin side
Narrow
Wide
Cylinder
Pin

6. Tighten the brake hose connecting bolt.

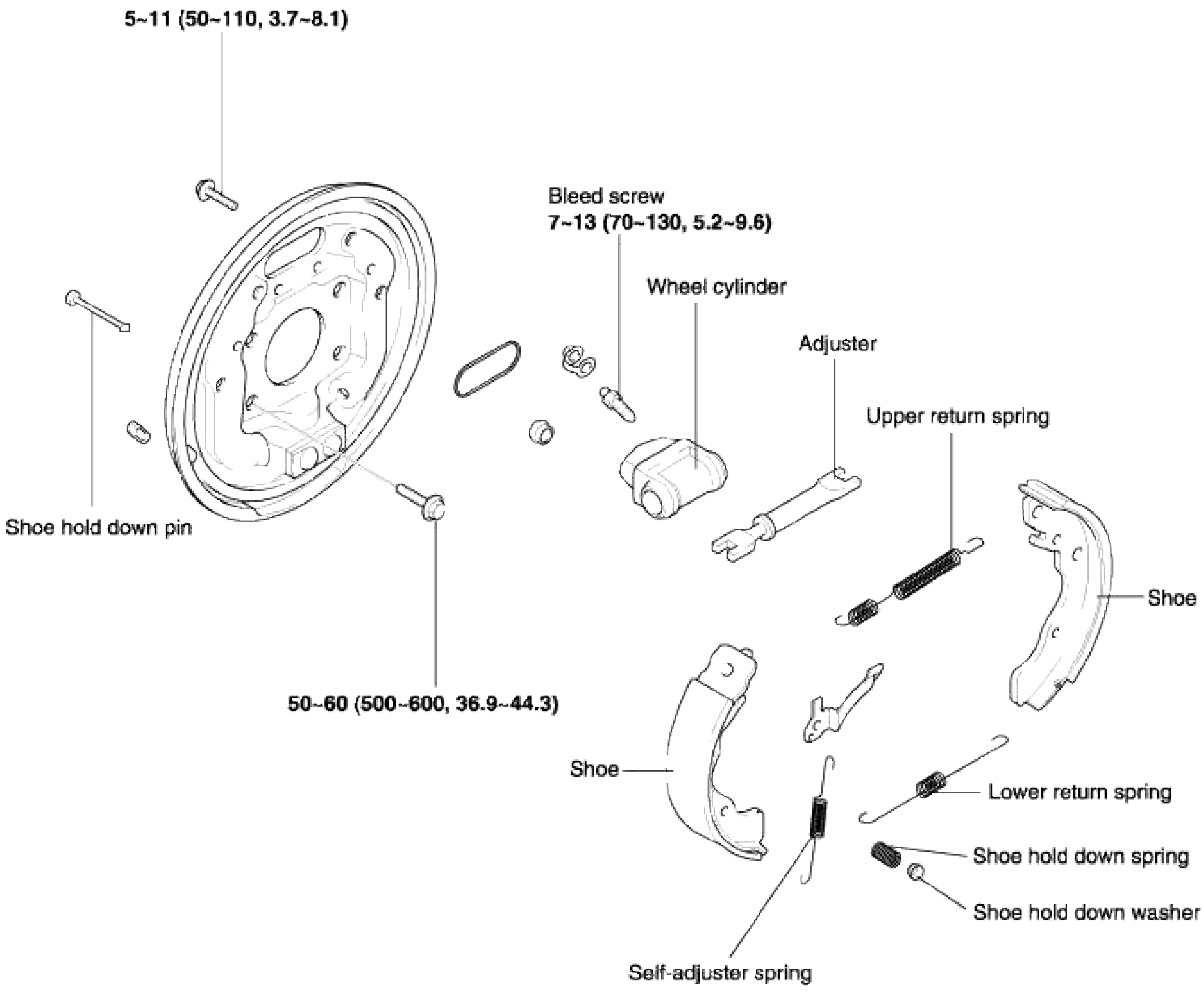
Tightening torque	Nm (kgf·cm, lbf·ft)
Sliding pin	34 ~ 44 (350~450, 26~33)
Sliding bolt	22 ~ 31 (220~320, 16~23)
Carrier mounting bolt	64 ~ 74 (650~750, 48~54)
Brake hose mounting oil bolt	25 ~ 29 (250~300, 18~22)

NOTE

1. Check that the surface of the pin and bolts are not damaged before tightening.
2. Bleed the system. Depress the pedal several times and check for fluid leakage from all connecting parts.

Brake System > Brake System > Rear Drum Brake > Components and Components Location

COMPONENTS


5~11 (50~110, 3.7~8.1)
Bleed screw
7~13 (70~130, 5.2~9.6)
Wheel cylinder
Adjuster
Upper return spring
Shoe
Shoe hold down pin
50~60 (500~600, 36.9~44.3)
Shoe
Lower return spring
Shoe hold down spring
Shoe hold down washer
Self-adjuster spring

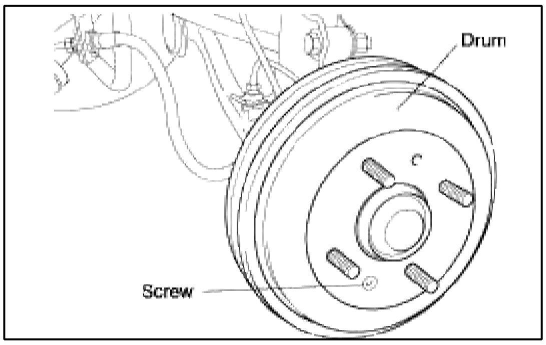
TORQUE: **Nm (kgf·cm, lbf·ft)**

Brake System > Brake System > Rear Drum Brake > Repair procedures

REMOVAL

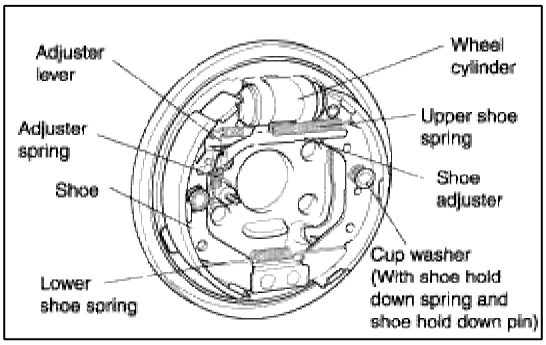
1. Release the parking brake.

2. After removing the wheel, remove the brake drum.

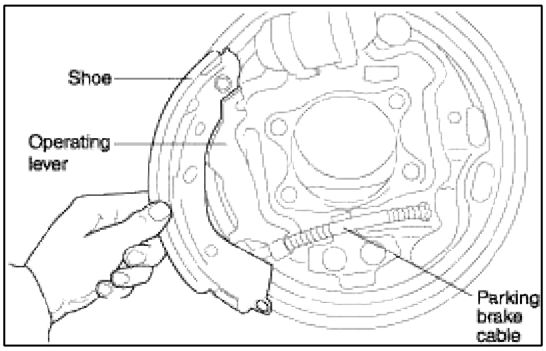


> NOTE
>
> When removing the brake drum, remove the screw.

3. Remove the adjuster spring and adjuster lever.
4. Remove the cup washer, shoe hold down spring, shoe hold down pin.
5. Move the shoe and remove the shoe adjuster.

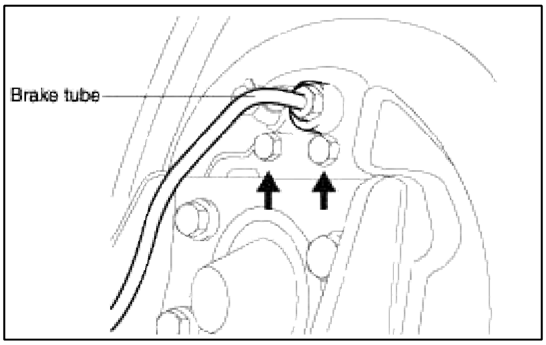

Adjuster lever
Adjuster spring
Shoe
Lower shoe spring
Wheel cylinder
Upper shoe spring
Shoe adjuster
Cup washer (With shoe hold down spring and shoe hold down pin)

6. Remove the lower shoe spring and upper shoe spring.
   Disconnect the parking cable from the operating lever.

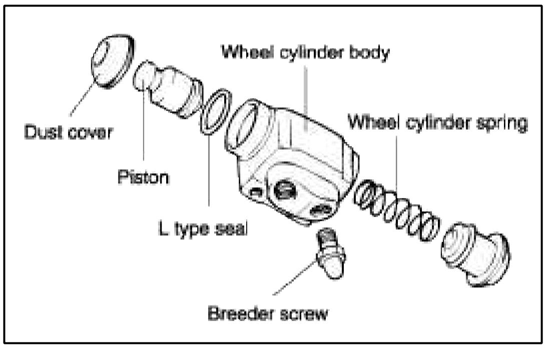

Shoe
Operating lever
Parking brake cable

REPLACMENT OF WHEEL CYLINDER

1. Remove the brake shoe.
2. Disconnect the brake tube.
3. Remove the wheel cylinder assembly.



4. Remove the dust boot.
5. Remove the piston and piston cup.
6. Remove the return spring.


Wheel cylinder body
Dust cover
Wheel cylinder spring
Piston
L type seal
Breeder screw

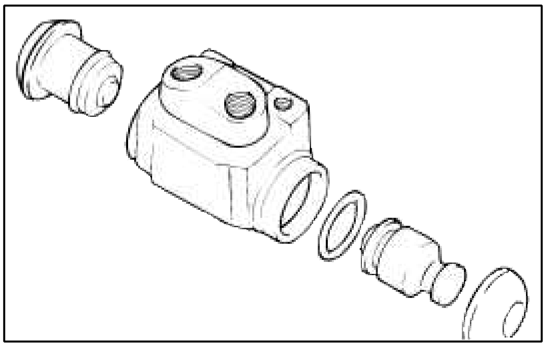
7. Before assembling the wheel cylinder, inspect the following.
   (1) Check the cylinder and piston for wear, damage and dust.
   (2) Check the cylinder body for damage and cracks.
   (3) Check the contact surface of the piston and shoes for wear.
   (4) Check the piston spring for looseness.
8. Assembly is the reverse of removal.

NOTE

1. Clean the cylinder and inner parts with isopropyl alcohol before assembly.
2. Apply enough brake fluid to the piston cups and cylinder.
3. Be sure to use new piston cups and dust boots.

CAUTION

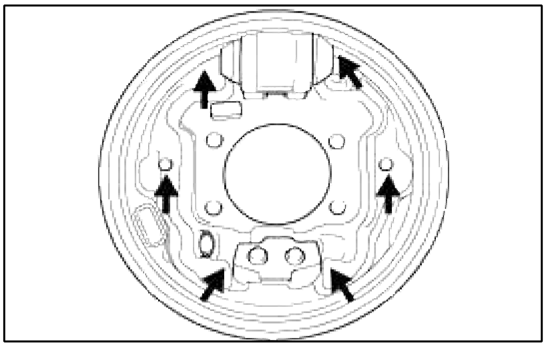
Be careful not to lose the steel ball in the bleeder.



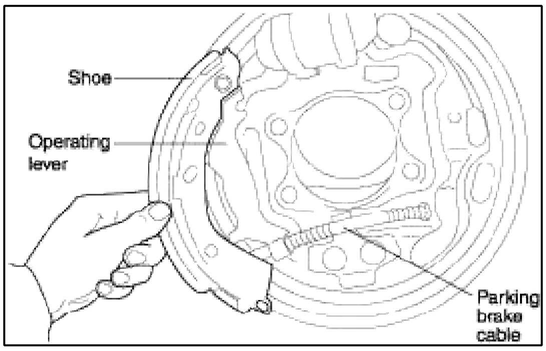
INSTALLTION

1. Apply the specified grease to the locations indicated in the illustration and to each component.
   A. Shoe and backing plate contact surfaces.
   B. Shoe and anchor plate contact surfaces.

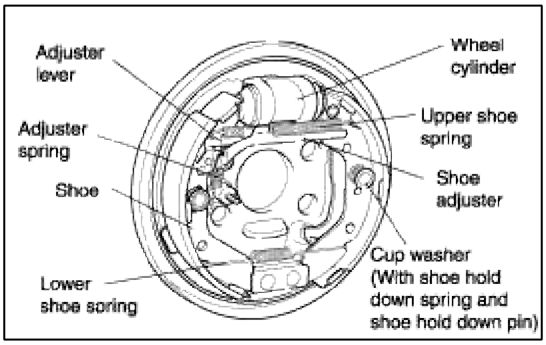
Recommended grease:
Multipurpose grease SAE J310, NLGI No.2



2. Connect the operating lever to the parking cable.


Shoe
Operating lever
Parking brake cable

3. Install the shoe hold-down pin.
4. Install the shoe adjuster and assemble the return spring.
5. Assemble the adjuster lever and adjuster spring.


Adjuster lever
Adjuster spring
Shoe
Lower shoe spring
Wheel cylinder
Upper shoe spring
Shoe adjuster
Cup washer (With shoe hold down spring and shoe hold down pin)

6. Assemble the drum and pull the parking brake lever to full stroke several times.

CAUTION

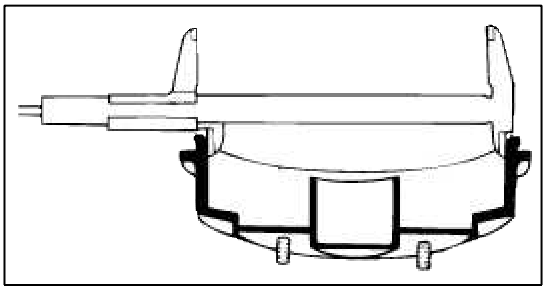
Be sure that the inside surface of drum is not contaminated by grease or other materials.

INSPECTION

1. Measure the inside diameter of the brake drum.
   Check the runout of the brake drum by using a dial indicator.

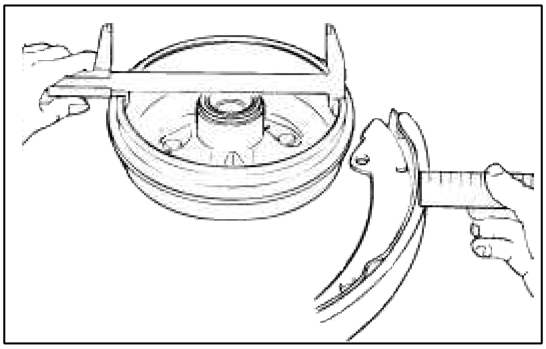
   Inside diameter mm (in.)
   Standard value: 180 (7.09)
   Service limit: 182 (7.17)

   Out-of-round (brake drum) mm (in.)
   Service limit: 0.05 (0.002)

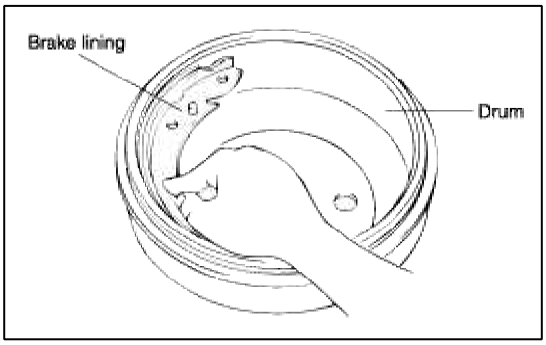


2. Measure the brake shoe lining thickness.

   Lining thickness mm (in.)
   Standard value: 4.8 (0.19)
   Service limit: 1 (0.04)



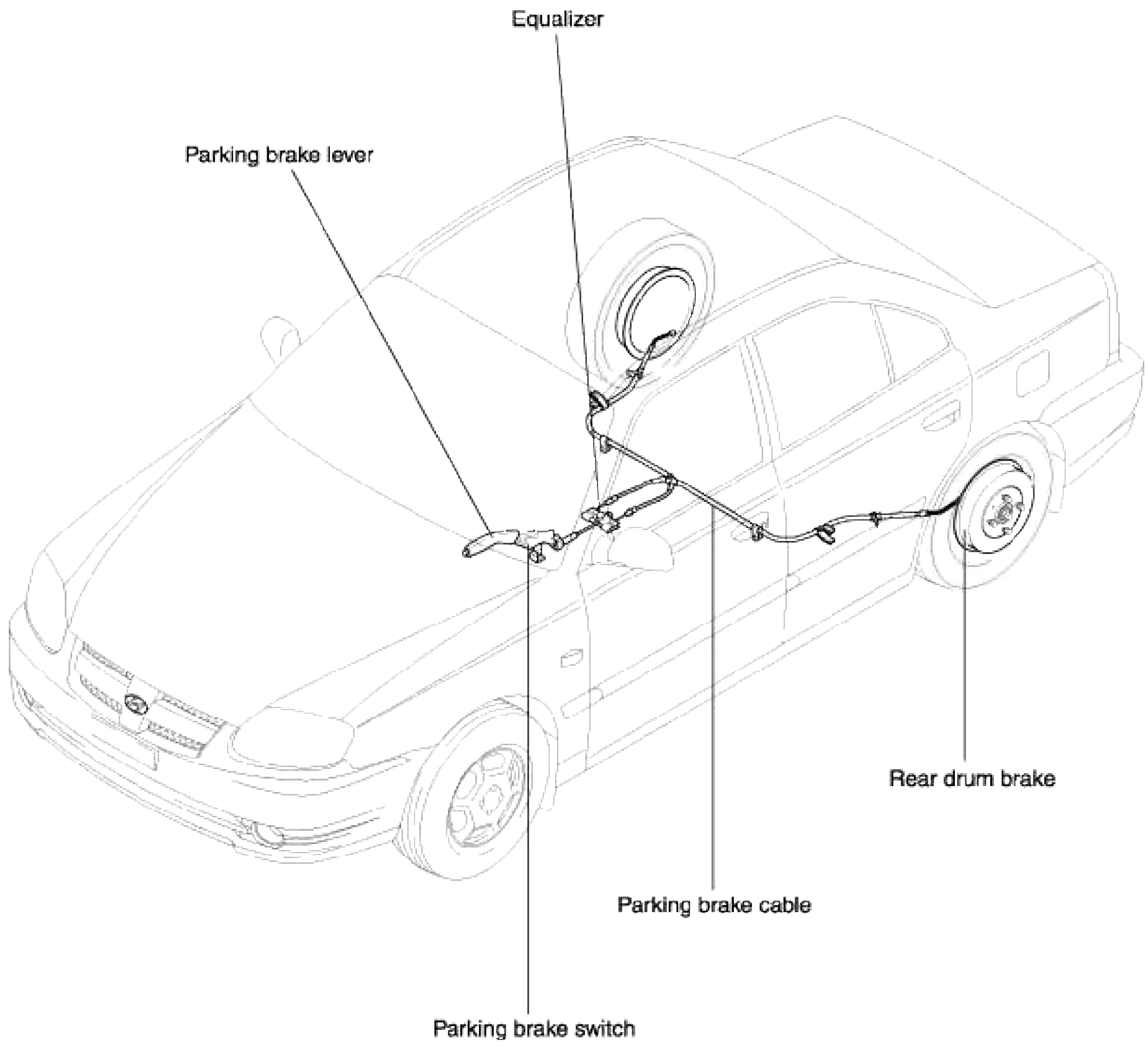
3. Inspect the brake lining and drum for proper contact.



4. Inspect the wheel cylinder outside for excessive wear and damage.
5. Inspect the backing plate for wear or damage.

Brake System > Parking Brake System > Parking Brake Assembly > Components and Components Location

COMPONENTS

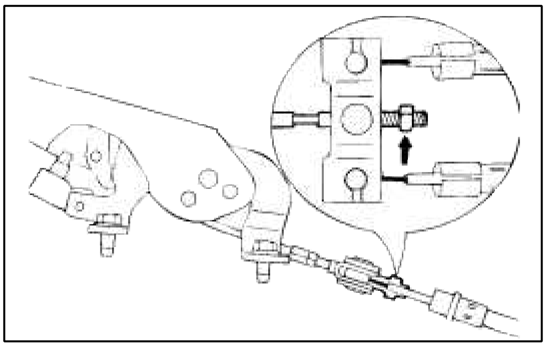

Equalizer
Parking brake lever
Rear drum brake
Parking brake cable
Parking brake switch

Brake System > Parking Brake System > Parking Brake Assembly > Repair procedures

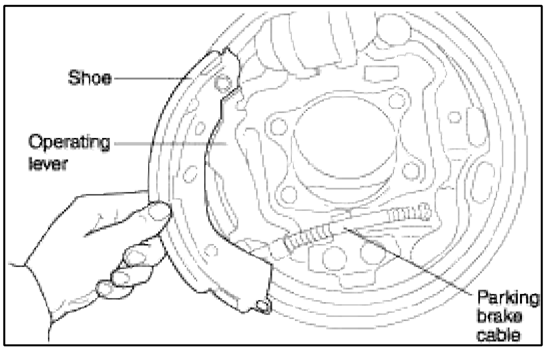
REMOVAL

1. Remove the console.

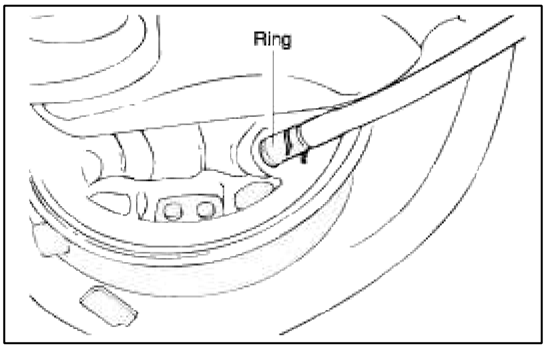
2. Loosen the adjusting nut and detach the parking brake cable.



3. Detach the parking brake switch assembly.
4. Remove the parking brake lever assembly.
5. Remove the rear wheel.
6. Remove the brake drum.
7. Remove the rear hub assembly.
8. Remove the brake shoe.
9. Disconnect the parking brake cable from the brake shoe operating lever.



10. Remove the parking brake cable retaining ring in the rear of the backing plate.

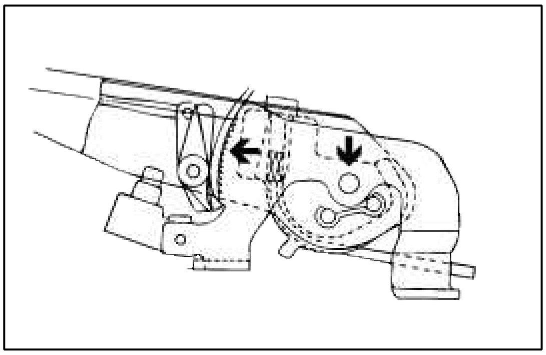


11. Loosen the parking brake cable clamp and remove the parking brake cable assembly.

INSTALLATION

1. Installation is the reverse of removal.

2. Parking brake cable adjustment
   (1) Depress and release the brake pedal 20 times with a force of 10 kgf.
   (2) Pull the parking brake lever to full stroke more than 3 times.
   (3) When pulling up the point where is at a distance of 25mm (0.98 in.) from the end of the lever with a force of 20 kgf, adjust the adjusting nut to the lever assembly so that lever is fixed to 6~7 notches.

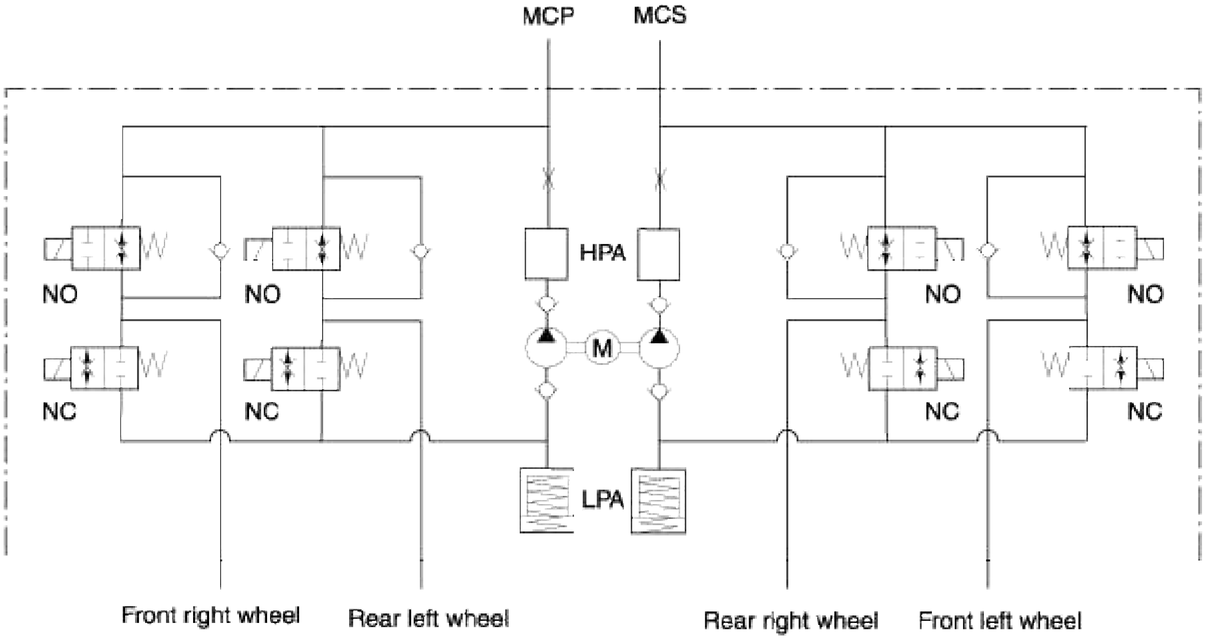


INSPECTION

1. Check the parking brake switch operation.
2. Check the parking brake lever ratchet for wear.
3. Check the parking brake cable for wear or damage.

Brake System > ABS(Anti-Lock Brake System) > Schematic Diagrams

HYDRAULIC SYSTEM DIAGRAM


MCP
MCS
HPA
M
LPA
NO
NO
NO
NO
NC
NC
NC
NC
Front right wheel
Rear left wheel
Rear right wheel
Front left wheel

HPA : High Pressure Accumulator
LPA : Low Pressure Accumulator
M : Pump Motor

NO : Normal Open Valve
NC : Normal Close Valve
MCP : Master Cylinder Primary
MCS : Master Cylinder Secondary

CIRCUIT DIAGRAM

CIRCUIT DIAGRAM (1)

CIRCUIT DIAGRAM (2)

Brake System > ABS(Anti-Lock Brake System) > Description and Operation

DESCRIPTION

1. Enables steering around obstacles with a greater degree of certainty, even during emergency braking.
2. Enables stopping during emergency braking while keeping stability and steerability even on curves.

ABS CONTROL

1. NORMAL BRAKING

Solenoid valve	State	Valve	Passage	Pump motor
IN (NO)	OFF	OPEN	Master cylinder Wheel cylinder	OFF
OUT (NC)	OFF	CLOSE	Wheel cylinder Reservoir	

Under the normal braking, voltage is not supplied to the solenoid valve, inlet valve is opened and outlet valve is closed. When the brake is depressed, brake fluid is supplied to the wheel cylinder via solenoid valve to activate the brake. When the brake is released, brake fluid is back to the master cylinder via inlet valve and check valve.

2. DUMP MODE

Solenoid valve	State	Valve	Passage	Pump motor
IN (NO)	ON	CLOSE	Master cylinder Wheel cylinder	ON
OUT (NC)	ON	OPEN	Wheel cylinder Reservoir	

Under the emergency braking, if the wheels start to lock up, HECU sends a signal to the solenoid valve to decrease the brake fluid, then voltage is supplied to each solenoid. At this time inlet valve is closed and brake fluid is blocked from the master cylinder. Conversely outlet valve is opened and brake fluid passes through wheel cylinder to reservoir, resulting in pressure decrease.

3. HOLD MODE

Solenoid valve	State	Valve	Passage	Pump motor
IN (NO)	ON	CLOSE	Master cylinder Wheel cylinder	ON
OUT (NC)	OFF	CLOSE	Wheel cylinder Reservoir	

When the brake fluid pressure is maximally decreased in wheel cylinder, HECU sends a signal to solenoid valve to keep the fluid pressure, voltage is supplied to inlet valve but it is not supplied to outlet valve. At this time inlet and outlet valves are closed and brake fluid is kept in wheel cylinder.

4. INCREASE MODE

Solenoid valve	State	Valve	Passage	Pump motor
IN (NO)	OFF	OPEN	Master cylinder Wheel cylinder	ON
OUT (NC)	OFF	CLOSE	Wheel cylinder Reservoir	

If HECU determines there's no lock-up in the wheel, HECU cuts voltage to solenoid valve. So voltage is not supplied to each solenoid valve, brake fluid passes through the inlet valve to wheel cylinder, resulting in pressure increase.

EBD (ELECTRONIC BRAKE-FORCE DISTRIBUTION) SYSTEM

The EBD system (Electronic Brake force Distribution) as a sub-system of the ABS system is to control the effective adhesion utilization by the rear wheels.

It further utilizes the efficiency of highly developed ABS equipment by controlling the slip of the rear wheels in the partial braking range.

The brake force is moved even closer to the optimum and controlled electronically, thus dispensing with the need for the proportioning valve.

The proportioning valve, because of a mechanical device, has limitations to achieve an ideal brake force distribution to the rear wheels.

As Well as to carry out the flexible brake force distribution proportioning to the vehicle load or weight increasing.

And in the event of malfunctioning, driver cannot notice whether it fails or not.

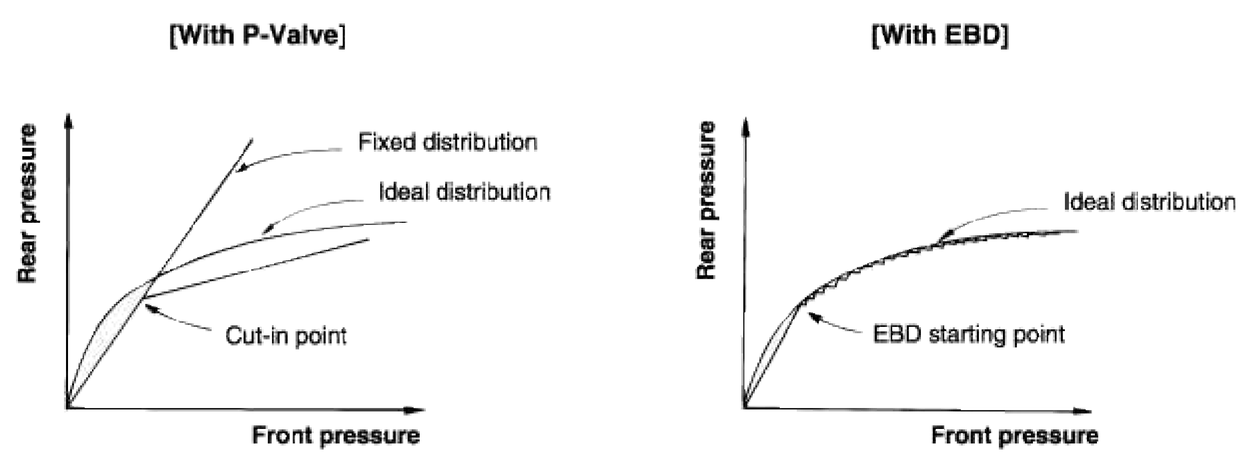
EBD controlled by the ABS Control Module, calculates the slip ratio of each wheel at all times and controls the brake pressure of the rear wheels not to exceed that of the front wheels.

If the EBD fails, the EBD warning lamp (Parking brake lamp) lights up.

ADVANTAGES

- Function improvement of the base-brake system.
- Compensation for the different friction coefficients.
- Elimination of the proportioning valve.
- Failure recognition by the warning lamp.

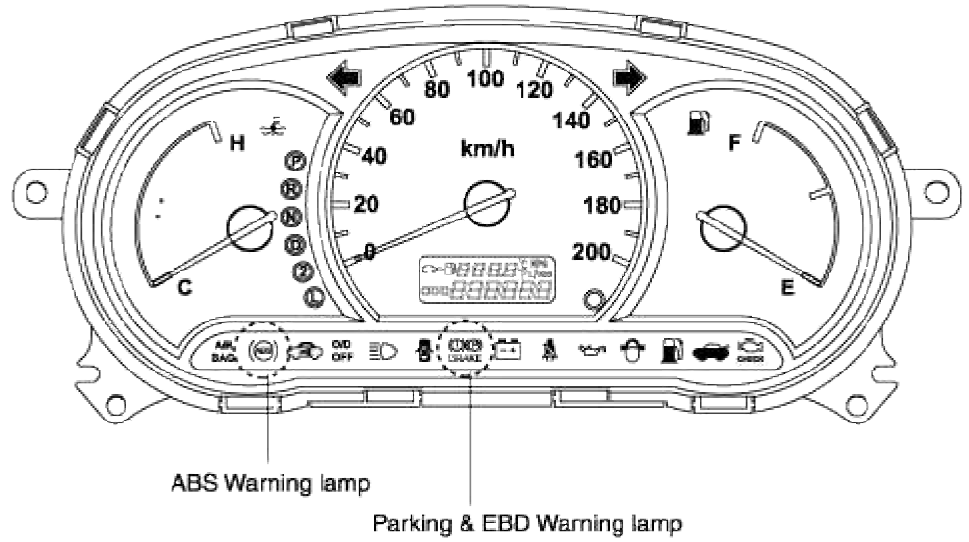
COMPARISON BETWEEN PROPORTIONING VALVE AND EBD



FAIL SAFE

FAIL CAUSE	SYSTEM		WARNING LAMP	
	ABS	EBD	ABS	EBD
None	ON	ON	OFF	OFF
Stop lamp switch failure	ON	ON	OFF	OFF
One wheel speed sensor failure	OFF	ON	ON	OFF
Pump malfunction	OFF	ON	ON	OFF
Low voltage	OFF	ON	ON	OFF
Two or more wheel speed sensor failure Solenoid valve failure HECU malfunction Over voltage Valve relay failure Other failure	OFF	OFF	ON	ON

WARNING LAMP CONTROL


80
100
120
60
140
40
km/h
160
20
180
0
200
H
C
F
E
P
R
N
D
2
L
AIR BAG
O/D OFF
BRAKE
CHECK
ABS Warning lamp
Parking & EBD Warning lamp

1. ABS warning lamp module
   The active ABS warning lamp module indicates the operating condition of the ABS.
   The ABS warning lamp is turned on under the following conditions.
   A. During the initialization phase after ignition switch ON. (3 seconds)
   B. In the event of inhibition of ABS functions by failure.
   C. When the system ECU is shut down even though ignition power is applied.
   D. During diagnostic mode.

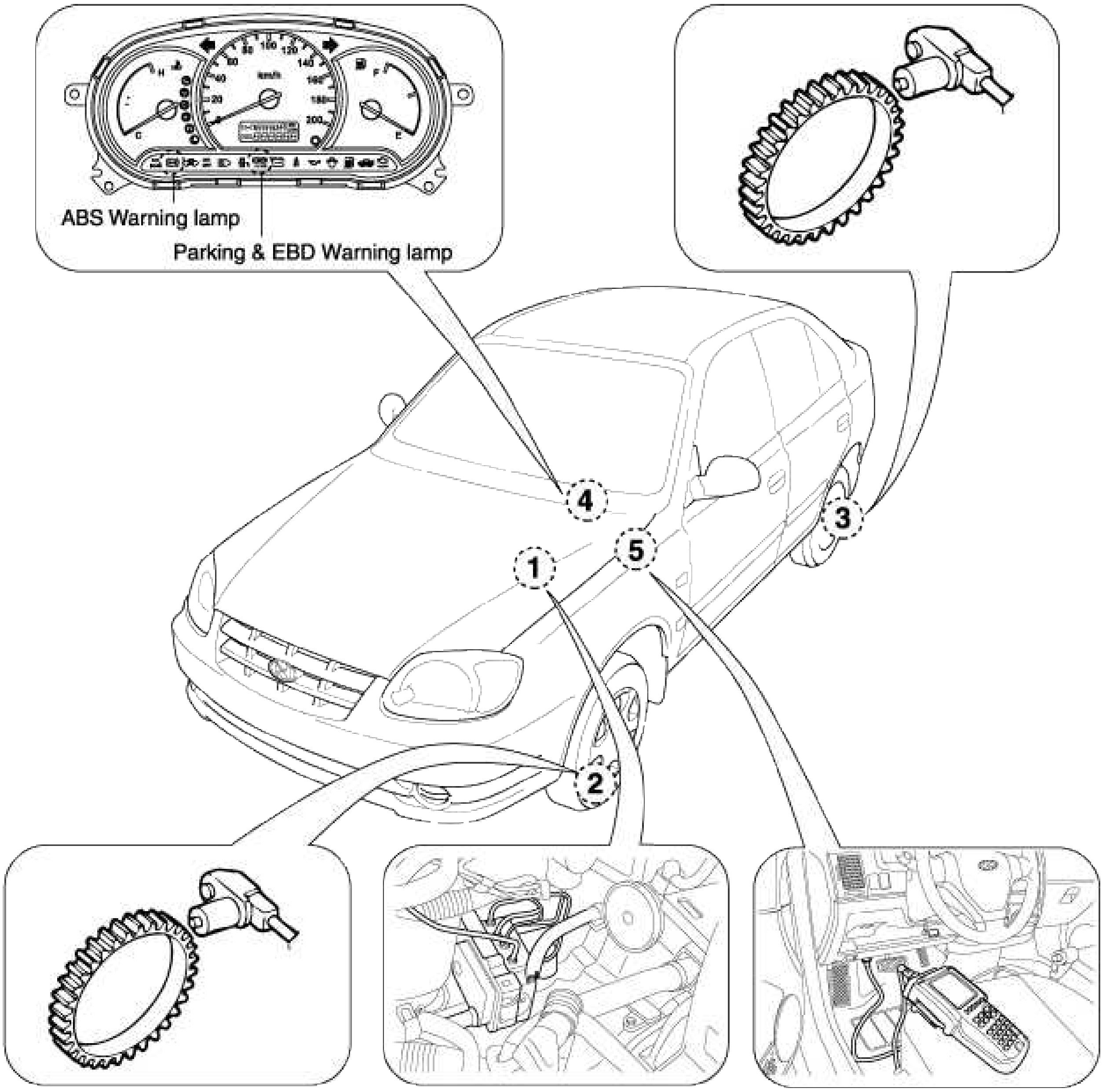
2. EBD warning lamp module

   The active EBD warning lamp module indicates the operating condition of the EBD. However, in case the parking brake switch is turned on, the EBD warning lamp is always turned on regardless of EBD functions. The EBD warning lamp is turned on under the following conditions.

   A. During the initialization phase after ignition switch ON. (3 seconds)
   B. In the event of inhibition of EBD functions by failure.
   C. When the system ECU is shut down even though ignition power is applied.
   D. When the parking brake switch is ON or brake fluid is low level.

Brake System > ABS(Anti-Lock Brake System) > Components and Components Location

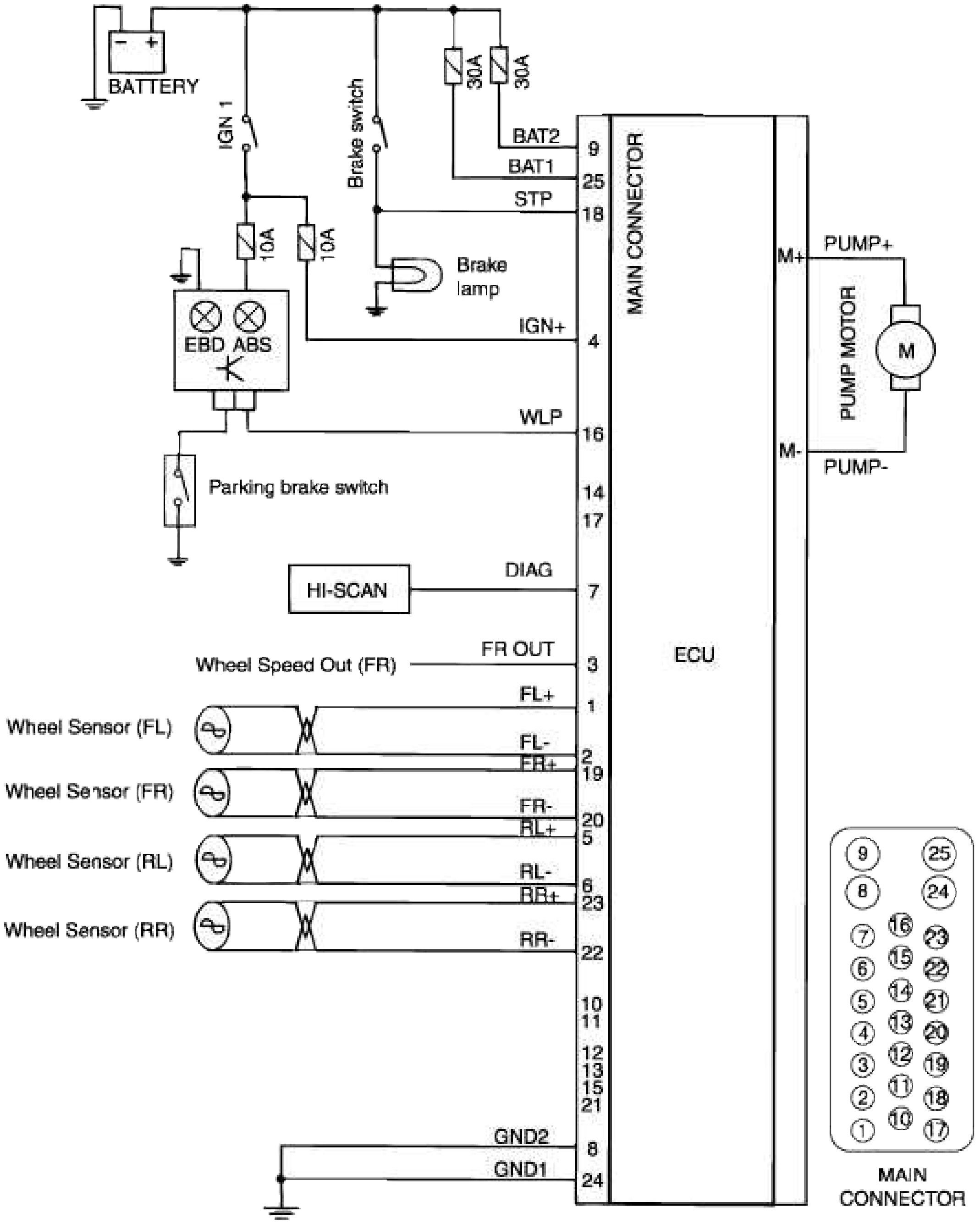
COMPONENTS


ABS Warning lamp
Parking & EBD Warning lamp
4
3
5
1
2

1. ABS Control module (HECU)
2. Front wheel speed sensor
3. Rear wheel speed sensor
4. ABS/EBD Warning lamp
5. Diagnosis

Brake System > ABS(Anti-Lock Brake System) > ABS Control Module > Schematic Diagrams

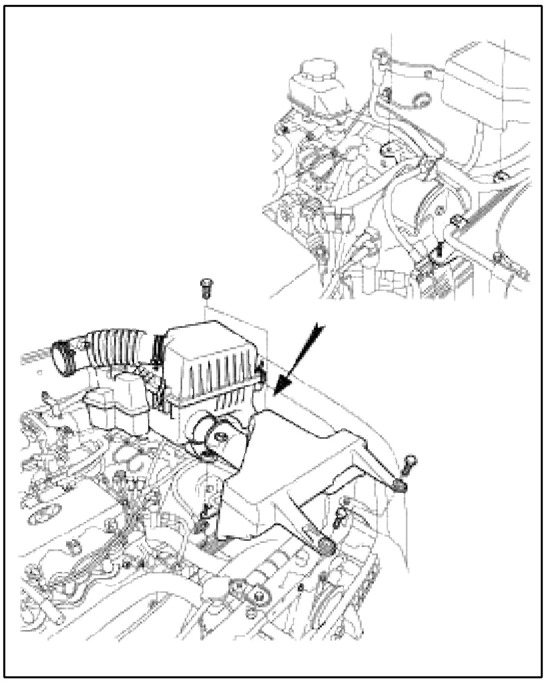
CIRCUIT DIAGRAM


BATTERY
IGN 1
Brake switch
30A
30A
10A
10A
BAT2
BAT1
STP
Brake lamp
EBD
ABS
IGN+
WLP
Parking brake switch
HI-SCAN
DIAG
Wheel Speed Out (FR)
FR OUT
Wheel Sensor (FL)
Wheel Sensor (FR)
Wheel Sensor (RL)
Wheel Sensor (RR)
FL+
FL-
FR+
FR-
RL+
RL-
RR+
RR-
GND2
GND1
9
25
18
4
16
14
17
7
3
1
2
19
20
5
6
23
22
10
11
12
13
15
21
8
24
MAIN CONNECTOR
ECU
M+
M-
PUMP+
PUMP-
PUMP MOTOR
M
MAIN CONNECTOR

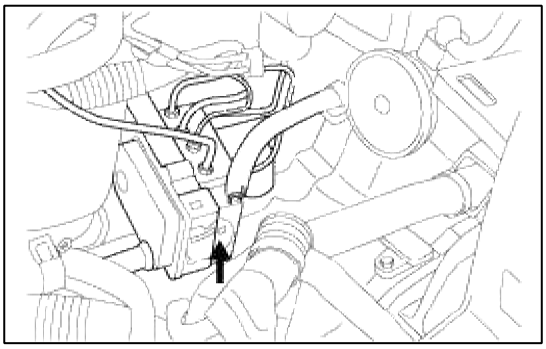
Brake System > ABS(Anti-Lock Brake System) > ABS Control Module > Repair procedures

REMOVAL

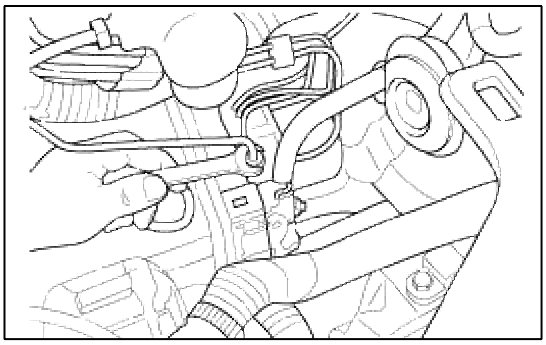
1. Remove the air-cleaner and the intake hose.



2. Disconnect the double lock connector from the HECU.



3. Disconnect the brake tubes from the HECU.



NOTE

- Do not spill brake fluid on the vehicle; it may damage the paint.
  If brake fluid gets on the paint, wash it off immediately with water.
- Take care not to damage or deform the brake lines during removal and installation.
- To prevent the brake fluid from flowing, plug and cover the hose ends and joints with a shop towel or equivalent material.

4. Remove the HECU bracket mounting bolts and remove the HECU.

CAUTION

1. Never attempt to disassemble the HECU.
2. The HECU must be transported and stored in an upright position and with the ports sealed.
   The HECU must not be drained.

Tightening torque
HECU bracket mounting bolt:
8 ~ 10 Nm (80 ~ 100 kg cm, 6 ~ 7.3 lb ft)

INSTALLATION

1. Install the HECU, then connect the brake lines.

Tightening torque
HECU mounting bolt:
8 ~ 10 Nm (80 ~ 100 kg·cm, 6 ~ 7.3 lb·ft)
Brake tube nut:
13 ~ 17 Nm (130 ~ 170 kg·cm, 10~12 lb·ft)

2. Connect the HECU connector.
3. Bleed the brake system.
4. Start the engine, and check that the ABS indicator goes off.
5. Test-drive the vehicle, and check that the ABS indicator does not come on.

ABS OPERATION CHECK

WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Raise the vehicle and release the parking brake.
2. Disconnect the HECU harness connector’s and measure from the harness side connector.

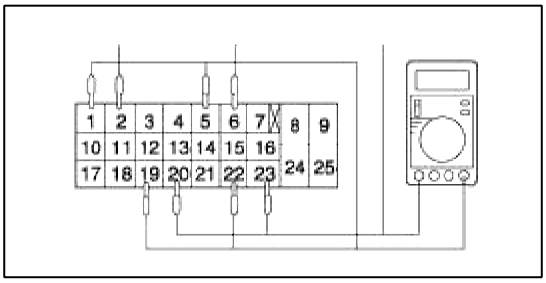
CAUTION

Be sure to remove the connector’s double lock and insert the probe into the harness side (back-probe). Inserting it into the terminal side may result in a bad connection.

3. Rotate the wheel to be measured approximately 1/2 to 1 rotation per second, and check the output voltage using a circuit tester or an oscilloscope.

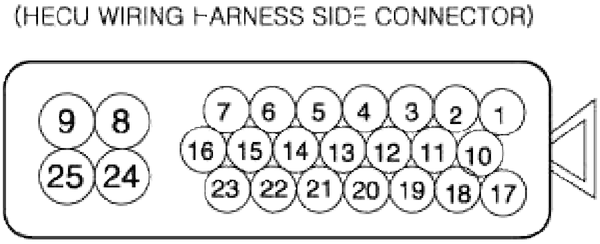
Wheel Speed Sensor	Front left	Front right	Rear left	Rear right
Terminal	1	19	5	22
	2	20	6	23

Output voltage :
When measuring with an oscilloscope : 130mV peak-to-peak or more


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

Brake System > ABS(Anti-Lock Brake System) > ABS Control Module > Specifications

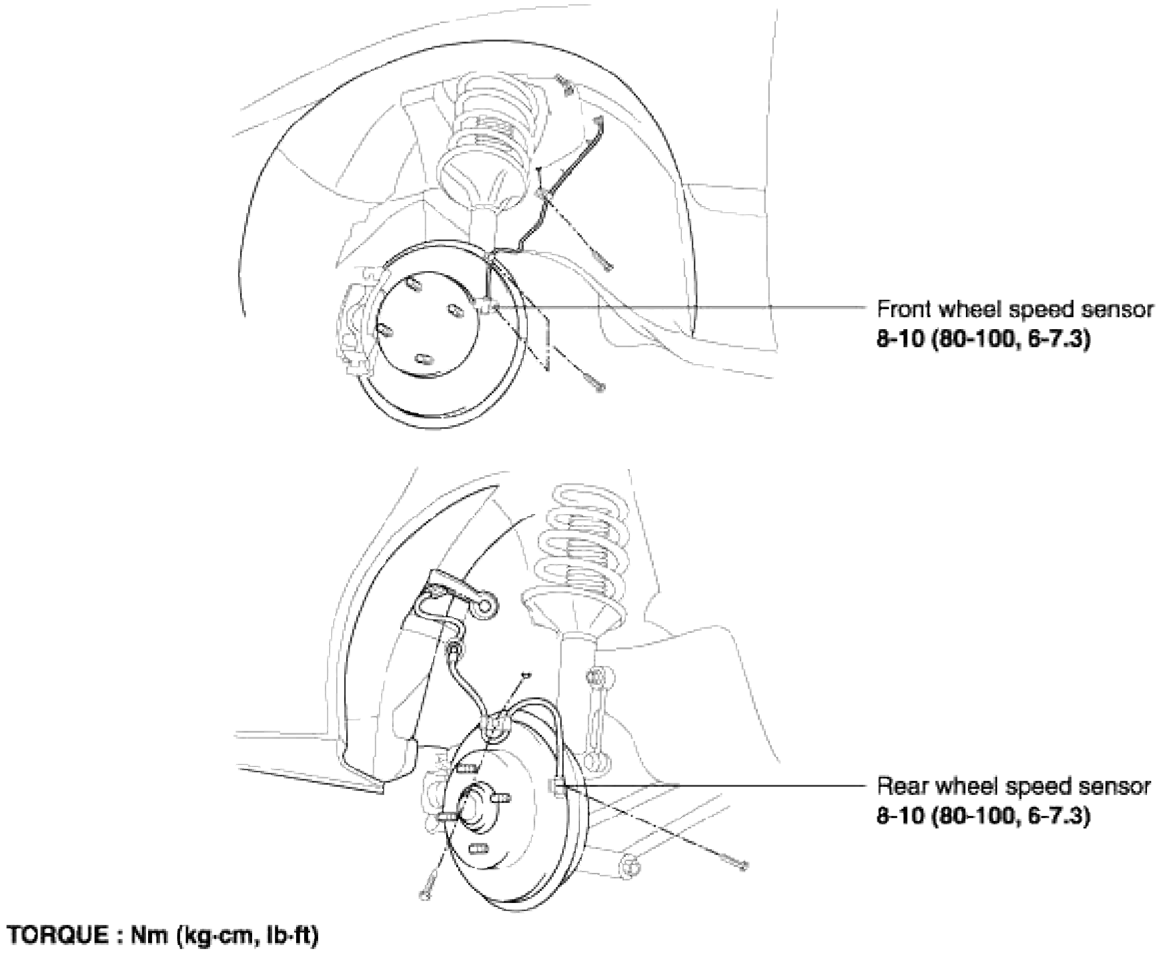
INSPECTION AT HECU TERMINALS


(HECU WIRING HARNESS SIDE CONNECTOR)
9
8
25
24
7
6
5
4
3
2
1
16
15
14
13
12
11
10
23
22
21
20
19
18
17

Connector terminal			Specification	Note
No.	Mark	Terminal name		
4	IGN+	Power source via ignition switch terminal	Over voltage range : 16.5 ± 0.5V < V < 20V Operating voltage range : 9.5 ± 0.5V < V < 16.5 ± 0.5V Low voltage range : 8.0V < V <9.5 ± 0.5V System down range : V < 7.5 ± 0.5V Max. current : I < 300mA	
8 24	GND1 GND2	Ground terminal	Max. current (Total of 2 terminals) : I < 60A	In ABS control
18	BRAKE	Brake lamp switch input terminal	Input voltage (Low) : 1.00 V < V_{IL} < 2.00V Input voltage (High) : 7.00V < V_{IH} <16.00V	
1 19 5 23 2 20 6 22	FL+ FR+ RL+ RR+ FL- FR- RL- RR-	Wheel sensor input terminal	Min. sensor voltage : $V_S > 130mV_{PP}$ Resistance : 1,385 ±110Ω Input range : 20 - 2000Hz Inductance : 0.7H ± 50% Permissible offset voltage range : 2.15V <V_{offset}<3.5V	
16	WLP	ABS and EBD warning lamp output terminal	Max. current : 1 < 200mA Saturation voltage, at I = 200mA : V_{sat} < 1.5V	
7	Diag.	Diagnosis interface terminal	Input voltage : V_{IL}< 0.3 V_BV, V_{IH}> 0.7 V_BV Output voltage : V_{OL}< 0.2 V_BV, V_{OH}> 0.8 V_BV	V_B: Ignition voltage
3	FR-out	Wheel speed output terminal	Max. current : 1 < 10mA External pull up resistance : above 10kΩ (open collector type)	
25	BAT1	Battery power Source 1 terminal (Valve power source)	Max. current (inside control) : 1 < 30A Max. current (Outside control) : 1 < 20mA	
9	BAT2	Battery power Source 2 terminal (Motor power source)	In ABS contol Max. rush current : I < 100A (t < 100 msec) Max. current : I < 30A (t > 100 msec) At IGN off Dark current : I < 0.5mA	t : The running time of motor

Brake System > ABS(Anti-Lock Brake System) > Front Wheel Speed Sensor > Components and Components Location

COMPONENTS

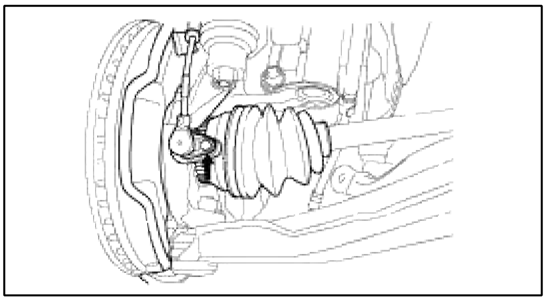

Front wheel speed sensor
8-10 (80-100, 6-7.3)
Rear wheel speed sensor
8-10 (80-100, 6-7.3)
TORQUE : Nm (kg·cm, lb·ft)

Brake System > ABS(Anti-Lock Brake System) > Front Wheel Speed Sensor > Repair procedures

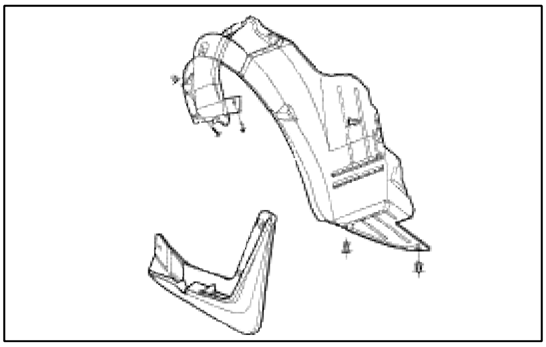
REMOVAL

FRONT WHEEL SPEED SENSOR

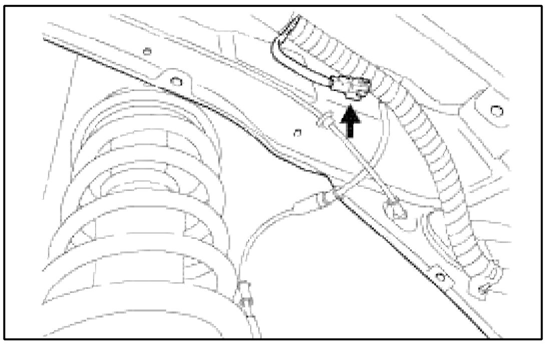
1. Remove the front wheel speed sensor mounting bolt.



2. Remove the front wheel guard.

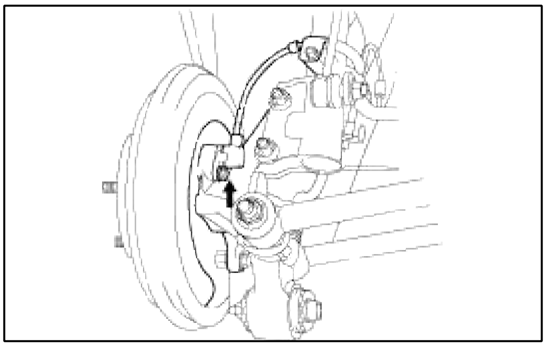


3. Remove the front wheel speed sensor after disconnecting the wheel speed sensor connector.

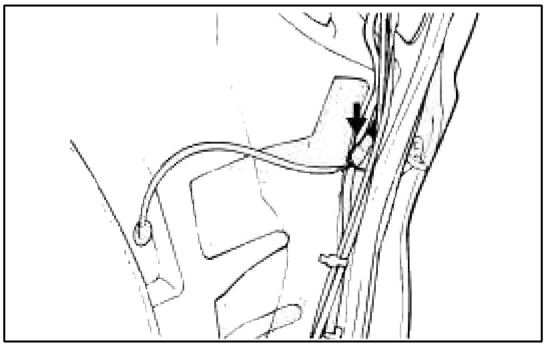


REAR WHEEL SPEED SENSOR

1. Remove the rear wheel speed sensor mounting bolt.

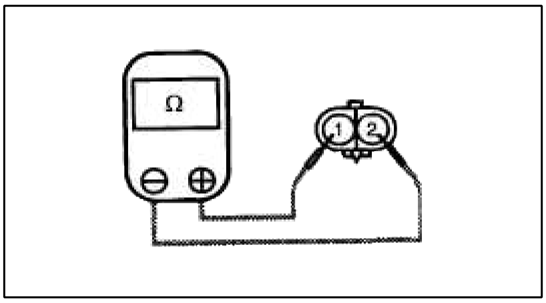


2. Remove the luggage trim and disconnect the wire connector from the rear wheel speed sensor.



INSPECTION

1. Connect an ohmmeter between the wheel speed sensor terminals and measure the resistance.

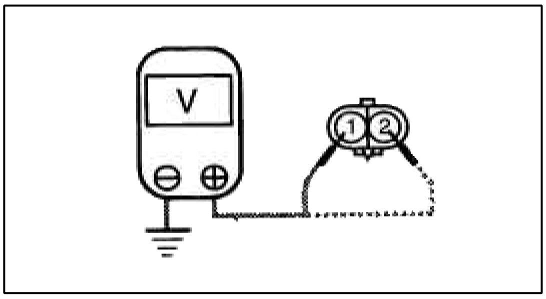


Service standard
Front, Rear: 1,385 ± 110Ω

2. Connect a voltmeter between the wheel speed sensor terminals and measure the voltage by turnong the wheel.

NOTE

Set the voltmeter to measure AC voltage.
Service standard : AC voltage detected.



Service standard
Output voltage: Min.130mVp.p

BLEEDING OF BRAKE SYSTEM

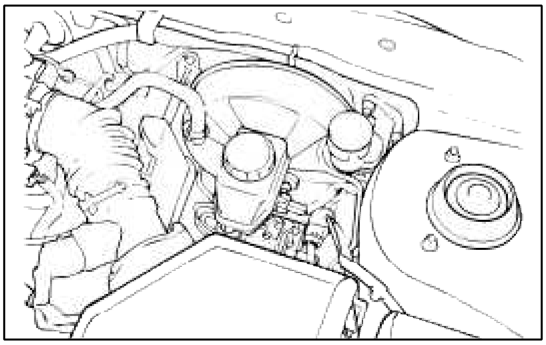
1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

CAUTION

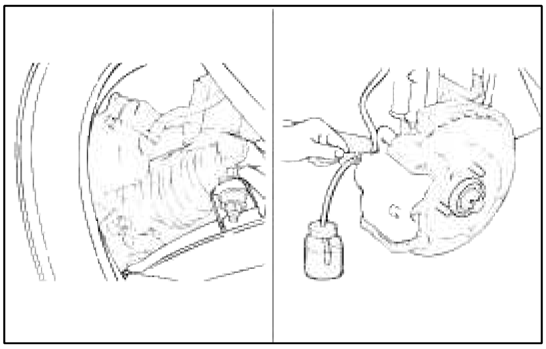
If there is any brake fluid on any painted surface, wash it off immediately.

NOTE

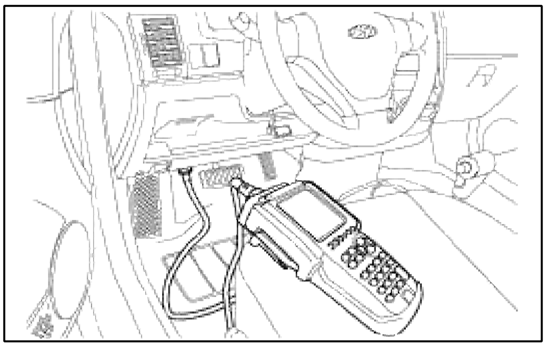
When pressure bleeding, do not depress the brake pedal.
Recommended fluid .... DOT3 or DOT4



2. Connect a clear plastic tube to the wheel cylinder bleeder plug and insert the other end of the tube into a half filled clear plastic bottle.



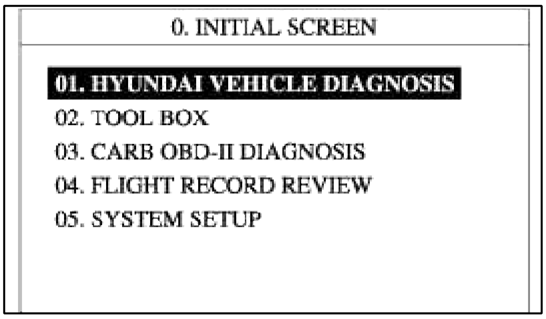
3. Connect the Hi-Scan (Pro) to the data link connector located underneath the dash panel.



4. Select and operate according to the instructions on the Hi-Scan (Pro) screen.

> **CAUTION**
>
> You must obey the maximum operating time of the ABS motor with the Hi-Scan (Pro) to prevent the motor pump from burning.

(1) Select hyundai vehicle diagnosis.



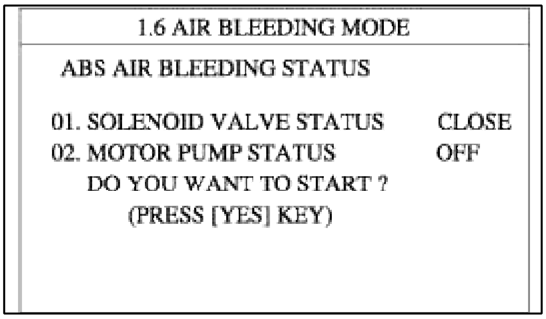
```
0. INITIAL SCREEN

01. HYUNDAI VEHICLE DIAGNOSIS
02. TOOL BOX
03. CARB OBD-II DIAGNOSIS
04. FLIGHT RECORD REVIEW
05. SYSTEM SETUP
```

(2) Select vehicle name.

(3) Select Anti-Lock Brake system.

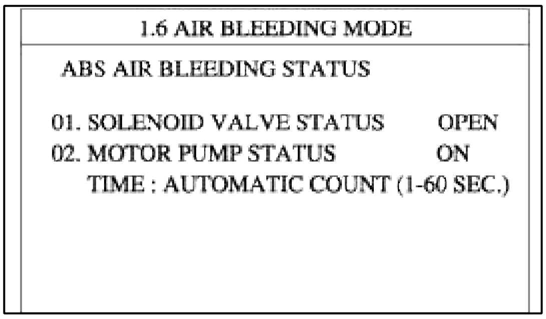
(4) Select air bleeding mode.

(5) Press ‘YES’ to operate motor pump and solenoid valve.



```
1.6 AIR BLEEDING MODE
ABS AIR BLEEDING STATUS

01. SOLENOID VALVE STATUS      CLOSE
02. MOTOR PUMP STATUS          OFF
    DO YOU WANT TO START ?
        (PRESS [YES] KEY)
```

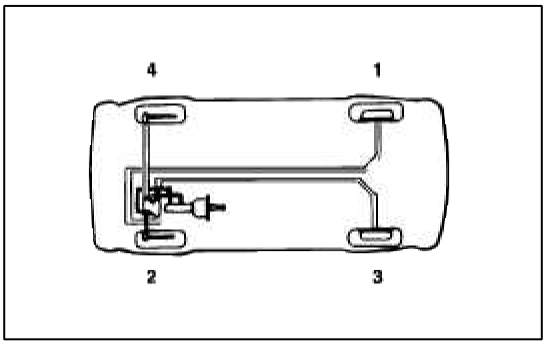
(6) Wait 60 sec. before operating the air bleeding.
(If not, you may damage the motor.)



```
1.6 AIR BLEEDING MODE
ABS AIR BLEEDING STATUS

01. SOLENOID VALVE STATUS      OPEN
02. MOTOR PUMP STATUS          ON
    TIME : AUTOMATIC COUNT (1-60 SEC.)
```

5. Pump the brake pedal several times, and then loosen the bleeder screw until fluid starts to run out without bubbles. Then close the bleeder screw.

6. Repeat step 5 until there are no more bubbles in the fluid for each wheel.



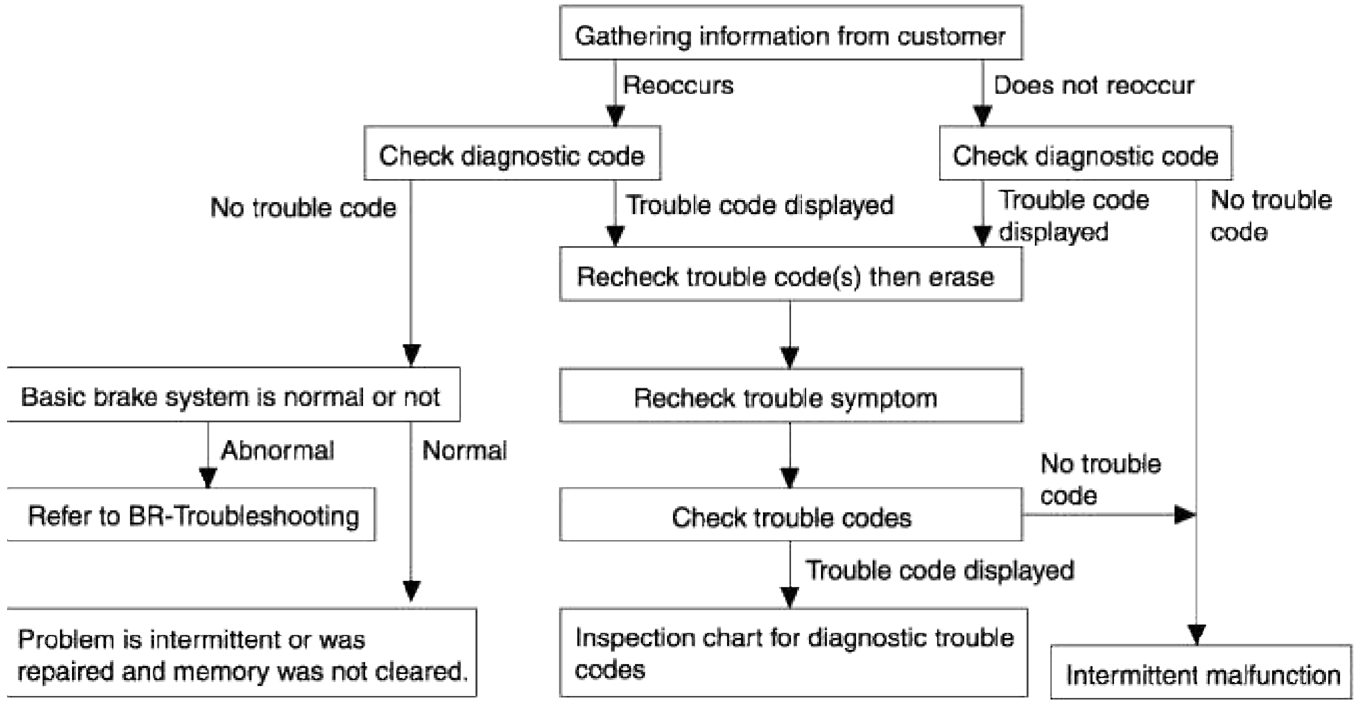
7. Tighten the bleeder screw.

Bleed screw tightening torque:
7 ~ 13 Nm (70 ~130 kg·cm, 5 ~ 9.5 lb·ft)

Brake System > ABS(Anti-Lock Brake System) > Troubleshooting

INSPECTION FOR TROUBLE SYMPTOMS

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING


Gathering information from customer
Reoccurs
Does not reoccur
Check diagnostic code
Check diagnostic code
No trouble code
Trouble code displayed
Trouble code displayed
No trouble code
Recheck trouble code(s) then erase
Basic brake system is normal or not
Recheck trouble symptom
Abnormal
Normal
No trouble code
Refer to BR-Troubleshooting
Check trouble codes
Trouble code displayed
Problem is intermittent or was repaired and memory was not cleared.
Inspection chart for diagnostic trouble codes
Intermittent malfunction

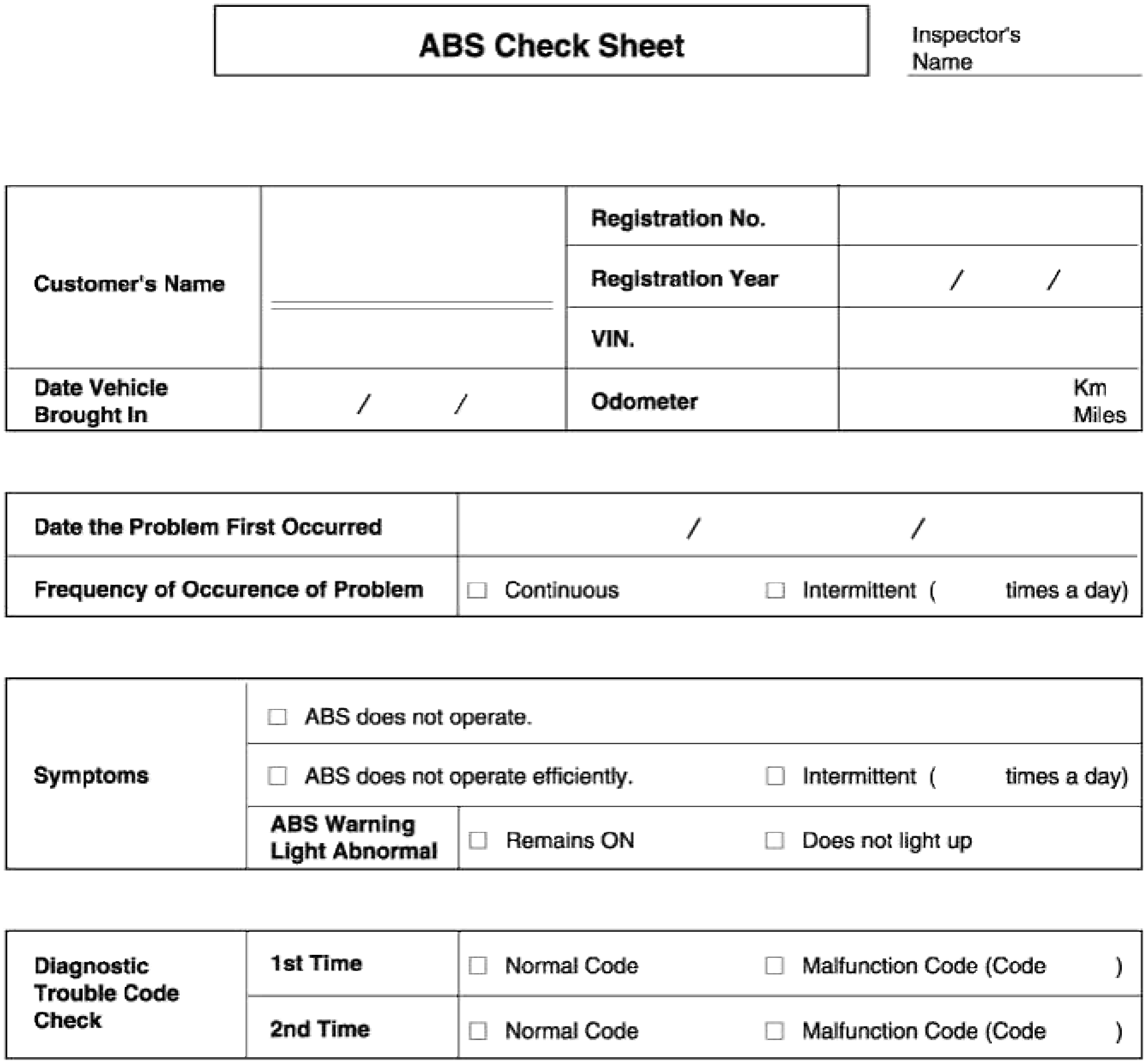
*** Using the customer problem analysis check sheet for reference, ask the customer as much detail as possible about the problem.**

NOTES WITH REGARD TO DIAGNOSIS

The phenomena listed in the following table is not abnormal.

PHENOMENON	EXPLANATION
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment. This is because the system operation check is being performed.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operation. (whine) 2. Sound is generated along with vibration of the brake pedal. (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump : suspension; squeak: tires)
ABS operation (Long braking distance)	For road surfaces such as snow-covered and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed.
Pedal kick back	Pedal kick back is normal operation.
Diagnosis detection conditions can vary depending on the diagnosis code. When checking the trouble symptom after the diagnosis code has been erased, ensure that the requirements listed in "Comment" are met.	

ABS CHECK SHEET



ABS Check Sheet

Inspector's Name

Customer's Name		**Registration No.**	
		Registration Year	/ /
		VIN.	
Date Vehicle Brought In	/ /	**Odometer**	Km Miles

Date the Problem First Occurred	/	/
Frequency of Occurence of Problem	☐ Continuous	☐ Intermittent (times a day)

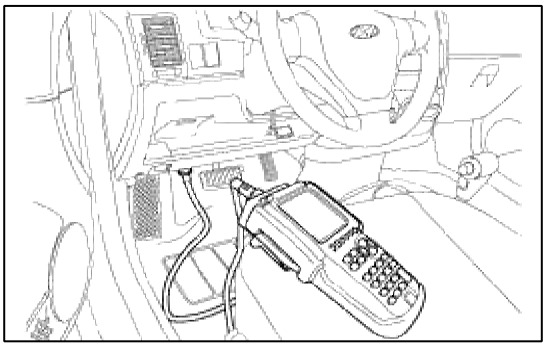
Symptoms	☐ ABS does not operate.		
	☐ ABS does not operate efficiently.		☐ Intermittent (times a day)
	ABS Warning Light Abnormal	☐ Remains ON	☐ Does not light up

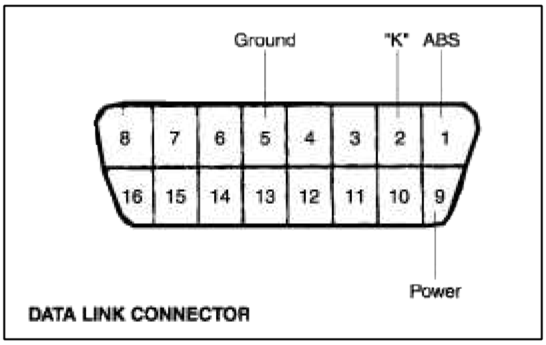
Diagnostic Trouble Code Check	**1st Time**	☐ Normal Code	☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code	☐ Malfunction Code (Code)

HI-SCAN (PRO) CHECK

1. Turn the ignition OFF.
2. Connect the Hi-Scan (Pro) to the data link connector located underneath the lower crash pad panel.
3. Turn the ignition ON.
4. Use the Hi-Scan (Pro) to check for diagnostic trouble codes.
5. After completion of the repair or correction of the problem, erase the stored fault codes using the clear key on the Hi-Scan (Pro).

6. Disconnect the Hi-Scan (Pro).





INSPECTION CHART FOR TROUBLE SYMPTOMS

TROUBLE SYMPTOMS		INSPECTION PROCEDURE NO.
Communication with Hi-Scan (Pro) is not possible.	Communication with any system is not possible.	1
	Communication with ABS only is not possible.	2
When the ignition key is turned to "ON" (engine OFF), the ABS warning lamp does not illuminate.		3
After the engine starts, the lamp remains illuminated.		4
Faulty ABS operation.	Unequal braking power on both sides.	5
	Insufficient braking power.	
	ABS operates under normal braking conditions.	
	ABS operates before vehicle stops under normal braking conditions.	
	Large brake pedal vibration. (See Caution)	

CAUTION

During ABS operation, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality

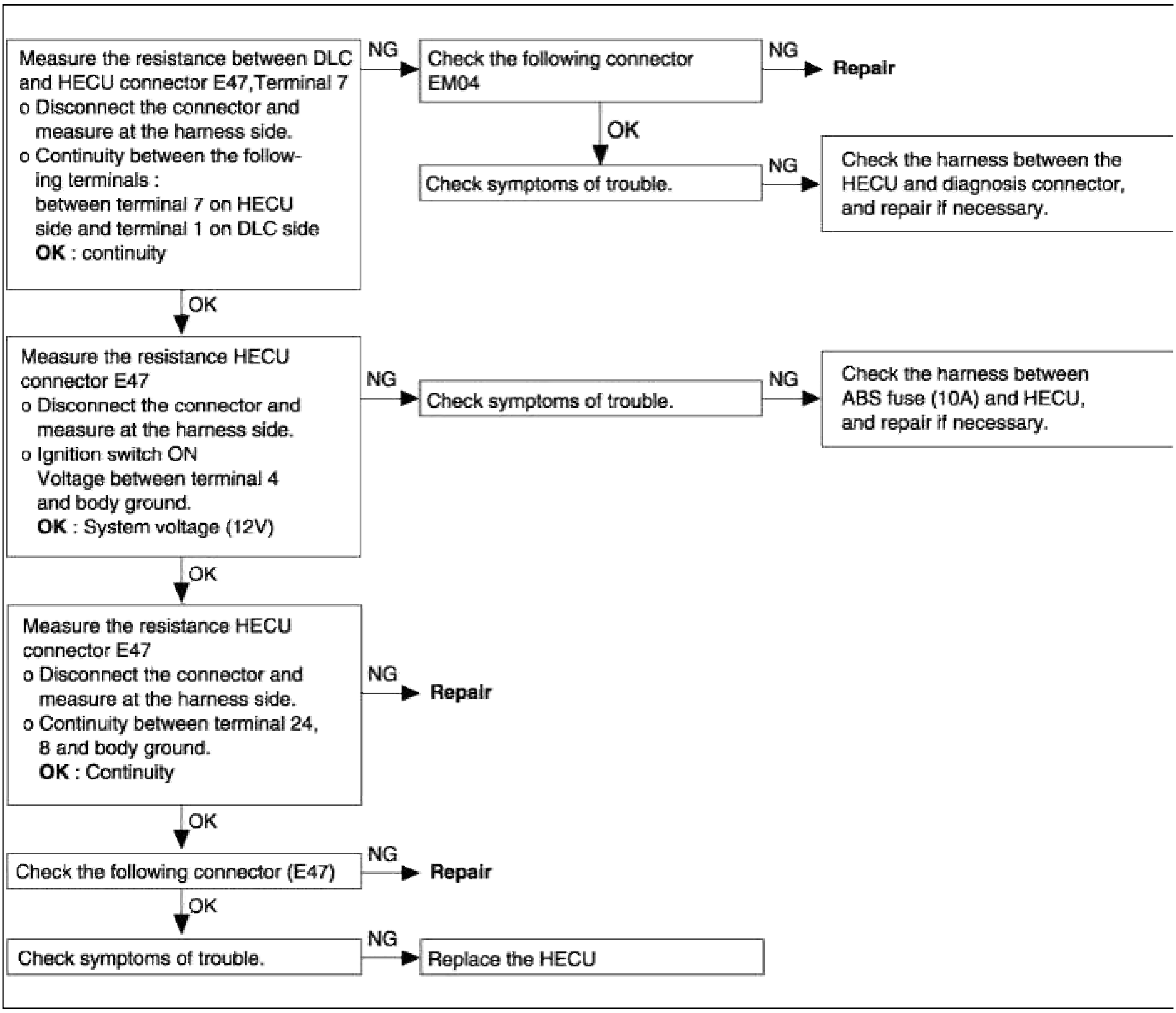
INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

Communication with Hi-Scan (Pro) is not possible. (Communication with all systems is not possible.)	Probable cause
Possible defect in the power supply system (including ground) for the diagnosis line.	• Malfunction of connector. • Malfunction of wiring harness.

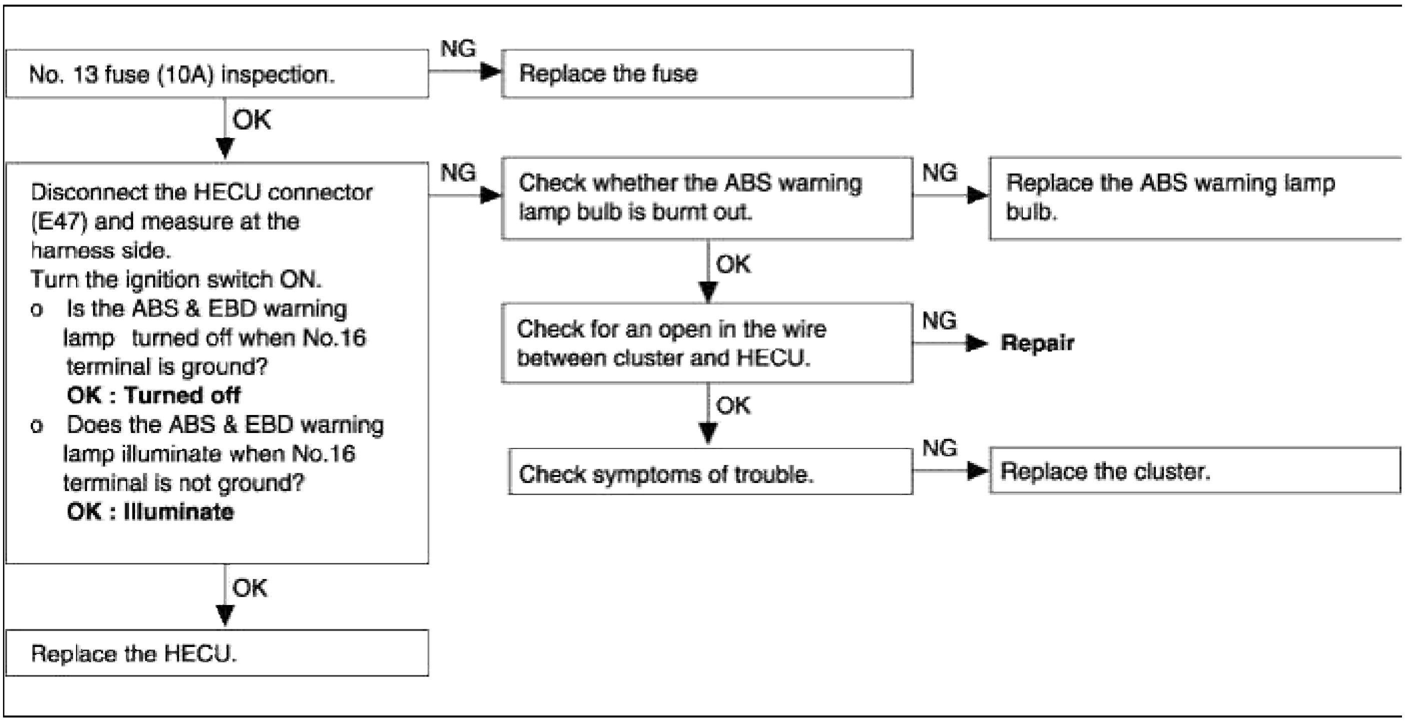
INSPECTION PROCEDURE 2

Communication with Hi-Scan (Pro) is not possible. (Communication with ABS only is not possible.)	Probable cause
When communication with Hi-Scan (Pro) is not possible, the cause may be probably an open circuit in the HECU power circuit or an open circuit in the diagnosis output circuit.	• Blown fuse. • Malfunction of wiring harness or connector. • Malfunction of HECU.


Measure the resistance between DLC and HECU connector E47,Terminal 7
o Disconnect the connector and measure at the harness side.
o Continuity between the following terminals :
between terminal 7 on HECU side and terminal 1 on DLC side
OK : continuity
NG
Check the following connector EM04
NG
Repair
OK
Check symptoms of trouble.
NG
Check the harness between the HECU and diagnosis connector, and repair if necessary.
OK
Measure the resistance HECU connector E47
o Disconnect the connector and measure at the harness side.
o Ignition switch ON
Voltage between terminal 4 and body ground.
OK : System voltage (12V)
NG
Check symptoms of trouble.
NG
Check the harness between ABS fuse (10A) and HECU, and repair if necessary.
OK
Measure the resistance HECU connector E47
o Disconnect the connector and measure at the harness side.
o Continuity between terminal 24, 8 and body ground.
OK : Continuity
NG
Repair
OK
Check the following connector (E47)
NG
Repair
OK
Check symptoms of trouble.
NG
Replace the HECU

INSPECTION PROCEDURE 3

When ignition key is turned "ON" (engine OFF), the ABS warning lamp does not illuminate.	Probable cause
When current flows in the HECU, the ABS warning lamp turns from on to off as the initial check. Therefore, if the lamp does not illuminate, the cause may be an open circuit in the lamp power supply circuit, a blown bulb, an open circuit in both the circuits between the ABS warning lamp and the HECU, and the malfunction of HECU.	• Blown fuse. • Burnt out ABS warning lamp bulb. • Malfunction of wiring harness or connector. • Malfunction of active warning lamp module. • Malfunction of HECU.

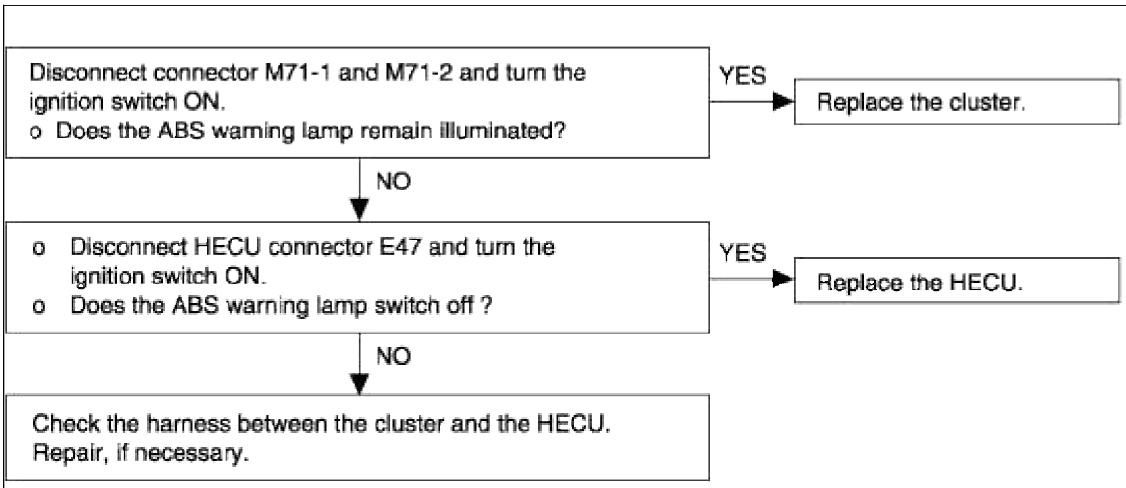

No. 13 fuse (10A) inspection.
NG
Replace the fuse
OK
Disconnect the HECU connector (E47) and measure at the harness side.
Turn the ignition switch ON.
o Is the ABS & EBD warning lamp turned off when No.16 terminal is ground?
OK : Turned off
o Does the ABS & EBD warning lamp illuminate when No.16 terminal is not ground?
OK : Illuminate
NG
Check whether the ABS warning lamp bulb is burnt out.
NG
Replace the ABS warning lamp bulb.
OK
Check for an open in the wire between cluster and HECU.
NG
Repair
OK
Check symptoms of trouble.
NG
Replace the cluster.
OK
Replace the HECU.

INSPECTION PROCEDURE 4

Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
A possible short-circuit in the ABS warning lamp illumination circuit.	• Malfunction of cluster. • Malfunction of HECU. • Malfunction of wiring harness.

NOTE

This trouble symptom is limited to cases where communication with the Hi-Scan (Pro) is possible (HECU power supply is normal) and DTC is normal.



Disconnect connector M71-1 and M71-2 and turn the ignition switch ON.
o Does the ABS warning lamp remain illuminated?

YES → Replace the cluster.

NO

o Disconnect HECU connector E47 and turn the ignition switch ON.
o Does the ABS warning lamp switch off ?

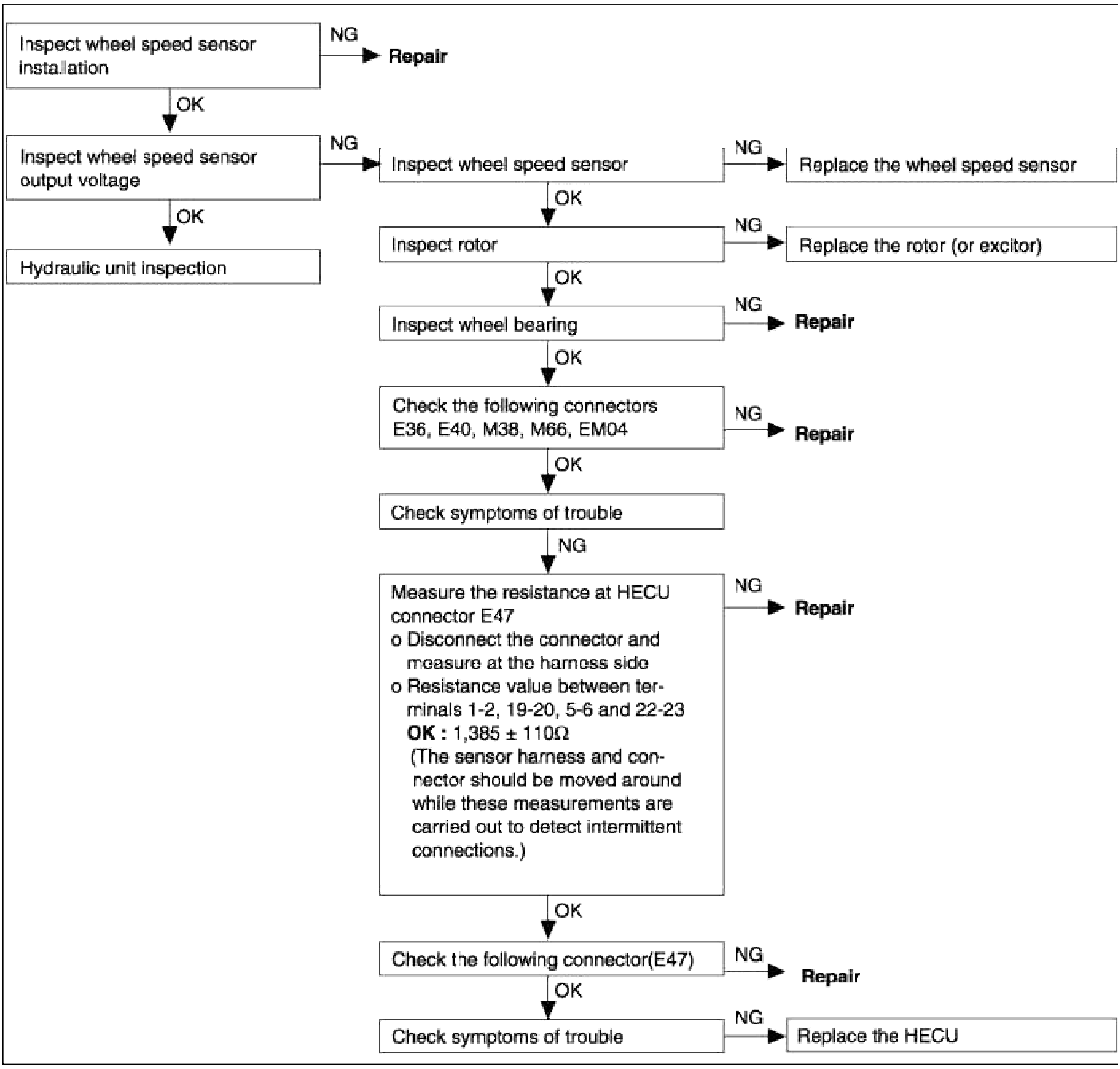
YES → Replace the HECU.

NO

Check the harness between the cluster and the HECU. Repair, if necessary.

INSPECTION PROCEDURE 5

Brake operation is abnormal.	Probable cause	
Brake operation varies depending on driving conditions and road surface conditions, so diagnosis can be difficult. However, if a normal DTC is displayed, carry out the following inspection.	• Improper installation of wheel speed sensor • Incorrect sensor harness contact. • Foreign material on wheel speed sensor.	• Malfunction of wheel speed sensor. • Malfunction of rotor. • Malfunction of wheel bearing. • Malfunction of HECU.


Inspect wheel speed sensor installation
NG
Repair
OK
Inspect wheel speed sensor output voltage
NG
Inspect wheel speed sensor
NG
Replace the wheel speed sensor
OK
Hydraulic unit inspection
OK
Inspect rotor
NG
Replace the rotor (or excitor)
OK
Inspect wheel bearing
NG
Repair
OK
Check the following connectors E36, E40, M38, M66, EM04
NG
Repair
OK
Check symptoms of trouble
NG
Measure the resistance at HECU connector E47
o Disconnect the connector and measure at the harness side
o Resistance value between terminals 1-2, 19-20, 5-6 and 22-23
OK : 1,385 ± 110Ω
(The sensor harness and connector should be moved around while these measurements are carried out to detect intermittent connections.)
NG
Repair
OK
Check the following connector(E47)
NG
Repair
OK
Check symptoms of trouble
NG
Replace the HECU

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

DTC	Trouble Location	Remarks
C1101	Battery voltage over volt : 18V or more	
C1102	Battery voltage low volt : 9.5V or less	
C1200	FL wheel sensor : open or short to ground	
C1201	- Range/Performance : speed jump or damaged exciter	
C1202	- No signal : air-gap error or wrong exciter	
C1203	FR wheel sensor : open or short to ground	
C1204	- Range/Performance : speed jump or damaged exciter	
C1205	- No signal : air-gap error or wrong exciter	
C1206	RL wheel sensor : open or short to ground	
C1207	- Range/Performance : speed jump or damaged exciter	
C1208	- No signal : air-gap error or wrong exciter	
C1209	RR wheel sensor : open or short to ground	
C1210	- Range/Performance : speed jump or damaged exciter	
C1211	- No signal : air-gap error or wrong exciter	
C1604	ECU hardware : ECU internal or valve failure	
C2112	Valve relay : valve relay or fuse failure	
C2402	Motor-Electrical : open or short to battery, motor relay, fuse or motor lock fail	

ACTUATOR DRIVING

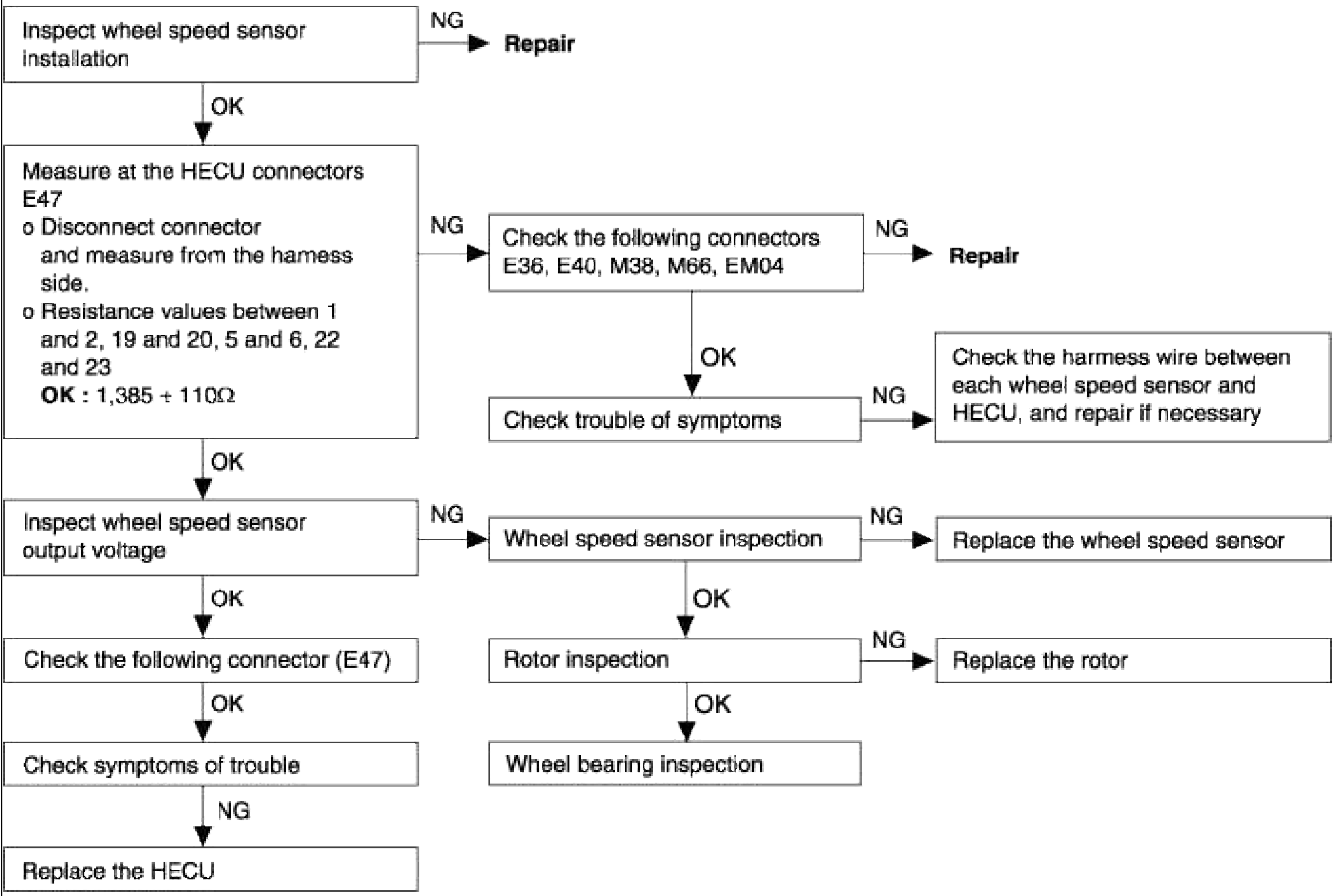
NO.	Description	Condition	Recognition	Time
01	Motor	KEY ON ENG. OFF	Motor pump relay operation (Click sounds)	2 seconds
02	Front left valve (In)		Front left solenoid valve operation (Click sounds)	
03	Front right valve (In)		Front right solenoid valve operation (Click sounds)	
04	Rear left valve (In)		Rear left solenoid valve operation (Click sounds)	
05	Rear right valve (In)		Rear right solenoid valve operation (Click sounds)	
06	Front left valve (Out)		Front left solenoid valve operation (Click sounds)	
07	Front right valve (Out)		Front right solenoid valve operation (Click sounds)	
08	Rear left valve (Out)		Rear left solenoid valve operation (Click sounds)	
09	Rear right valve (Out)		Rear right solenoid valve operation (Click sounds)	

CURRENT DATA

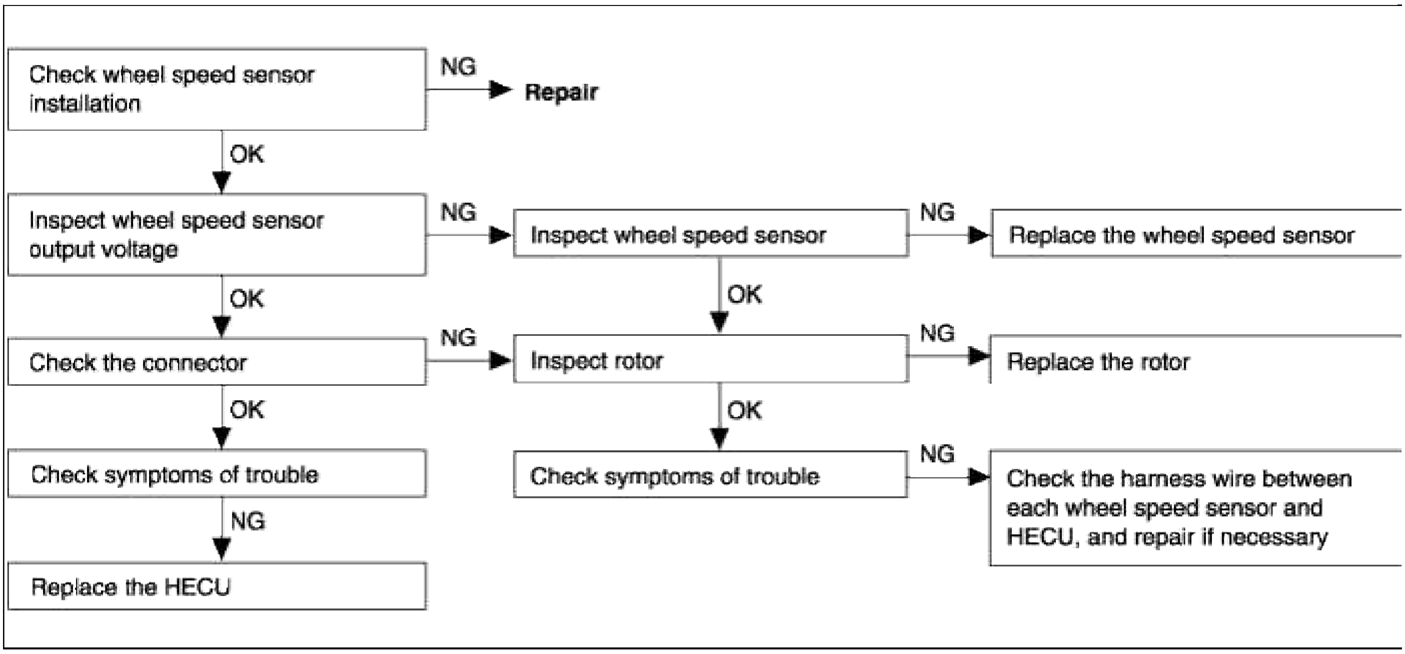
NO.	Description	Recognition	Unit
1	Battery	Battery	Voltage
2	FL wheel speed SNSR	Front left wheel speed sensor	km/h
3	FR wheel speed SNSR	Front right wheel speed sensor	
4	RL wheel speed SNSR	Rear left wheel speed sensor	
5	RR wheel speed SNSR	Rear right wheel speed sensor	
6	ABS SRI status	Warning lamp	ON/OFF
7	Brake SW	Brake switch	
8	Motor pump relay	Motor relay	
9	Valve relay	Valve relay	
10	Motor pump status	Motor	
11	FL valve (In)	Front left valve (In)	
12	FR valve (In)	Front right valve (In)	
13	RL valve (In)	Rear left valve (In)	
14	RR valve (In)	Rear right valve (In)	
15	FL valve (Out)	Front left valve (Out)	
16	FR valve (Out)	Front right valve (Out)	
17	RL valve (Out)	Rear left valve (Out)	
18	RR valve (Out)	Rear right valve (Out)	

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

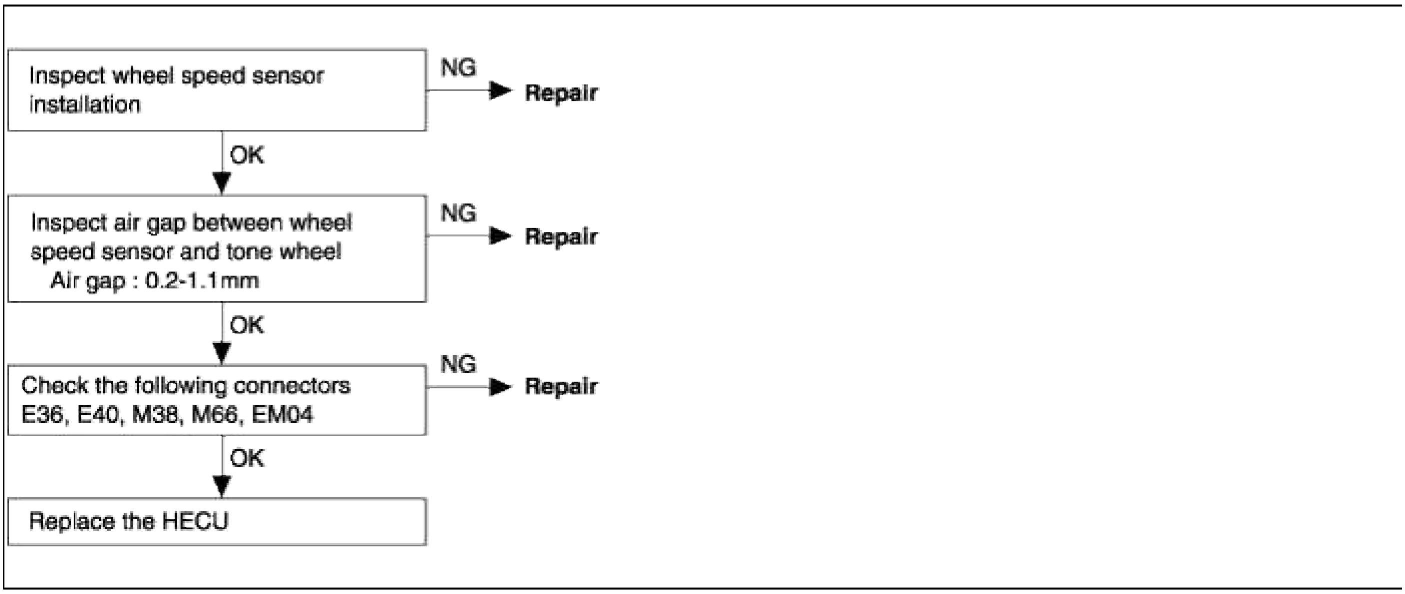
DTC No. C1200, C1203, C1206, C1209 Wheel speed sensor open or short to GND circuit	Probable cause
The HECU determines that an open or short circuit has occurred in more than one wire of a wheel speed sensor.	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of HECU


Inspect wheel speed sensor installation
NG
Repair
OK
Measure at the HECU connectors E47
o Disconnect connector and measure from the harness side.
o Resistance values between 1 and 2, 19 and 20, 5 and 6, 22 and 23
OK : 1,385 ± 110Ω
NG
Check the following connectors E36, E40, M38, M66, EM04
NG
Repair
OK
Check trouble of symptoms
NG
Check the harmess wire between each wheel speed sensor and HECU, and repair if necessary
OK
Inspect wheel speed sensor output voltage
NG
Wheel speed sensor inspection
NG
Replace the wheel speed sensor
OK
OK
Check the following connector (E47)
Rotor inspection
NG
Replace the rotor
OK
OK
Check symptoms of trouble
Wheel bearing inspection
NG
Replace the HECU

DTC No C1201, C1204, C1207, C1210 Wheel speed sensor signal error	Probable cause
Abnormal output signal from a wheel speed sensor other than an open or short circuit.	• Improper installation of wheel speed sensor. • Malfunction of wheel speed sensor. • Malfunction of rotor • Malfunction of wheel bearing. • Malfunction of siring harness or connector. • Malfunction of HECU.


Check wheel speed sensor installation
NG
Repair
OK
Inspect wheel speed sensor output voltage
NG
Inspect wheel speed sensor
NG
Replace the wheel speed sensor
OK
OK
Check the connector
NG
Inspect rotor
NG
Replace the rotor
OK
OK
Check symptoms of trouble
Check symptoms of trouble
NG
Check the harness wire between each wheel speed sensor and HECU, and repair if necessary
NG
Replace the HECU

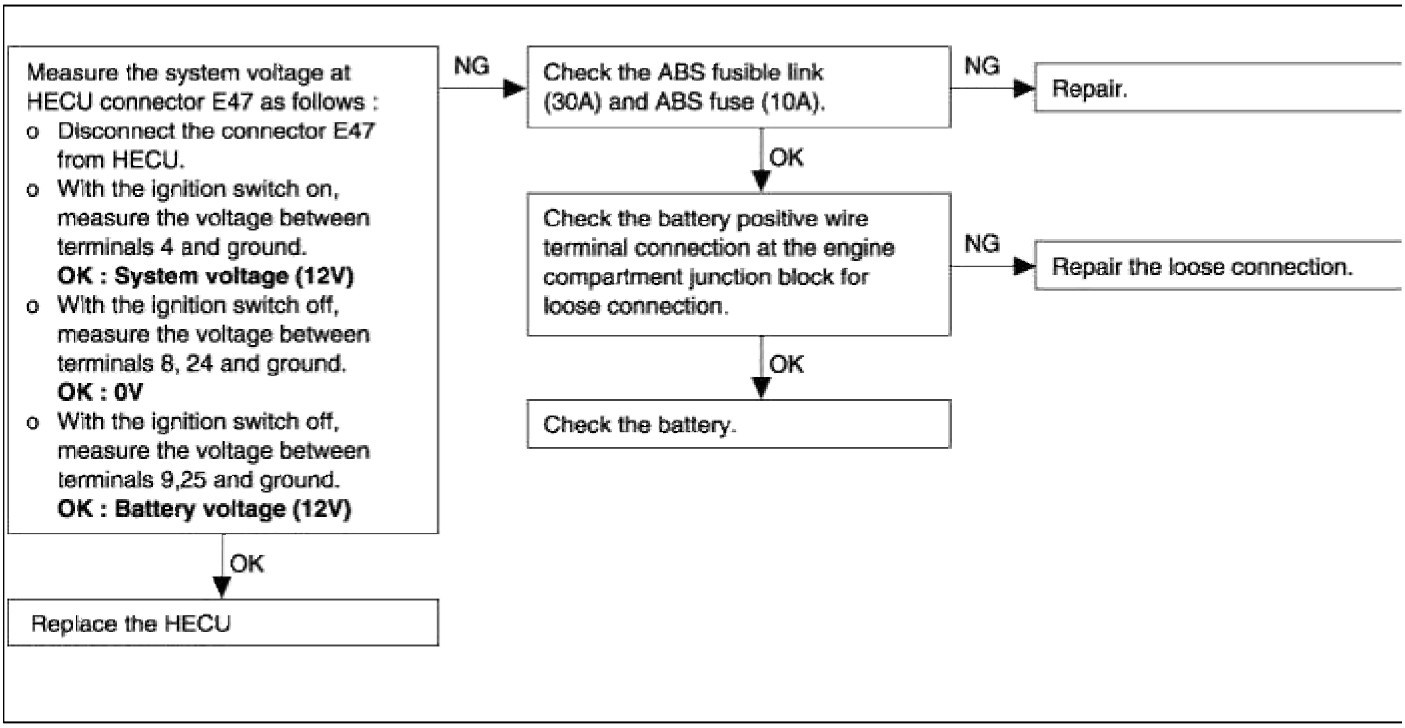
DTC No. C1202, C1205, C1208, C1211 (Large air gap)	Probable cause
No wheel speed sensor output signal.	• Malfunction of wheel speed sensor • Improper installation of wheel speed sensor • Malfunction of rotor (excitor) • Malfunction of wiring harness or connector • Malfunction of HECU


Inspect wheel speed sensor installation
NG
Repair
OK
Inspect air gap between wheel speed sensor and tone wheel
Air gap : 0.2-1.1mm
NG
Repair
OK
Check the following connectors E36, E40, M38, M66, EM04
NG
Repair
OK
Replace the HECU

DTC No. C1101, C1102 Voltage out of range. (Over and under voltage)	Probable cause
The voltage of the HECU power supply drops lower than or rises higher than the specified value. If the voltage returns to the specified value, this code is no longer output.	• Malfunction of wiring harness or connector. • Malfunction of HECU • Blown ABS fuse.

CAUTION

If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to the standard value, the code is no longer output. Before carrying out the following inspection, check the battery level, and refill if necessary.



Measure the system voltage at HECU connector E47 as follows :

- Disconnect the connector E47 from HECU.
- With the ignition switch on, measure the voltage between terminals 4 and ground.
  OK : System voltage (12V)
- With the ignition switch off, measure the voltage between terminals 8, 24 and ground.
  OK : 0V
- With the ignition switch off, measure the voltage between terminals 9,25 and ground.
  OK : Battery voltage (12V)

Check the ABS fusible link (30A) and ABS fuse (10A).

Repair.

Check the battery positive wire terminal connection at the engine compartment junction block for loose connection.

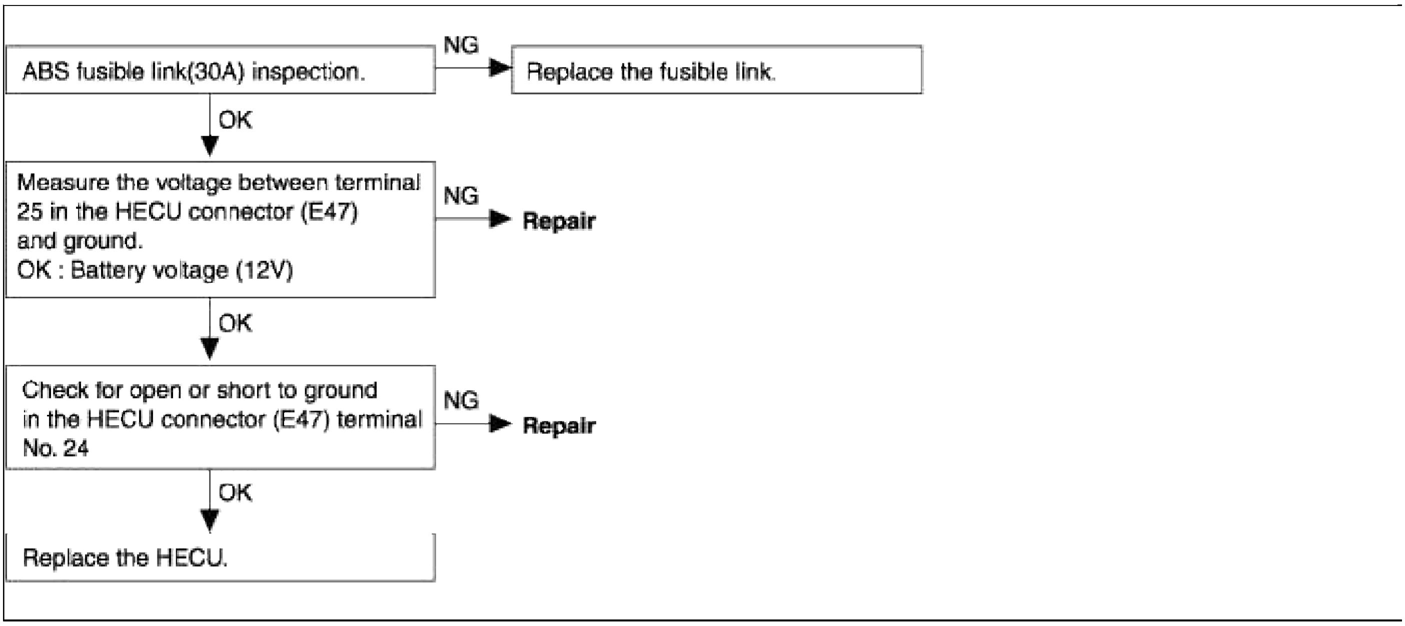
Repair the loose connection.

Check the battery.

Replace the HECU

DTC No. C1604 HECU Hardware. HECU hardware error. (EEPROM and ECU failure)	Probable cause
The HECU always monitors the solenoid valve drive circuit. It determines that there is an open or short-circuit in the solenoid coil or in a harness even if no current flows in the solenoid or through the HECU.	• Malfunction of wiring harness or connector. • Malfunction of HECU.

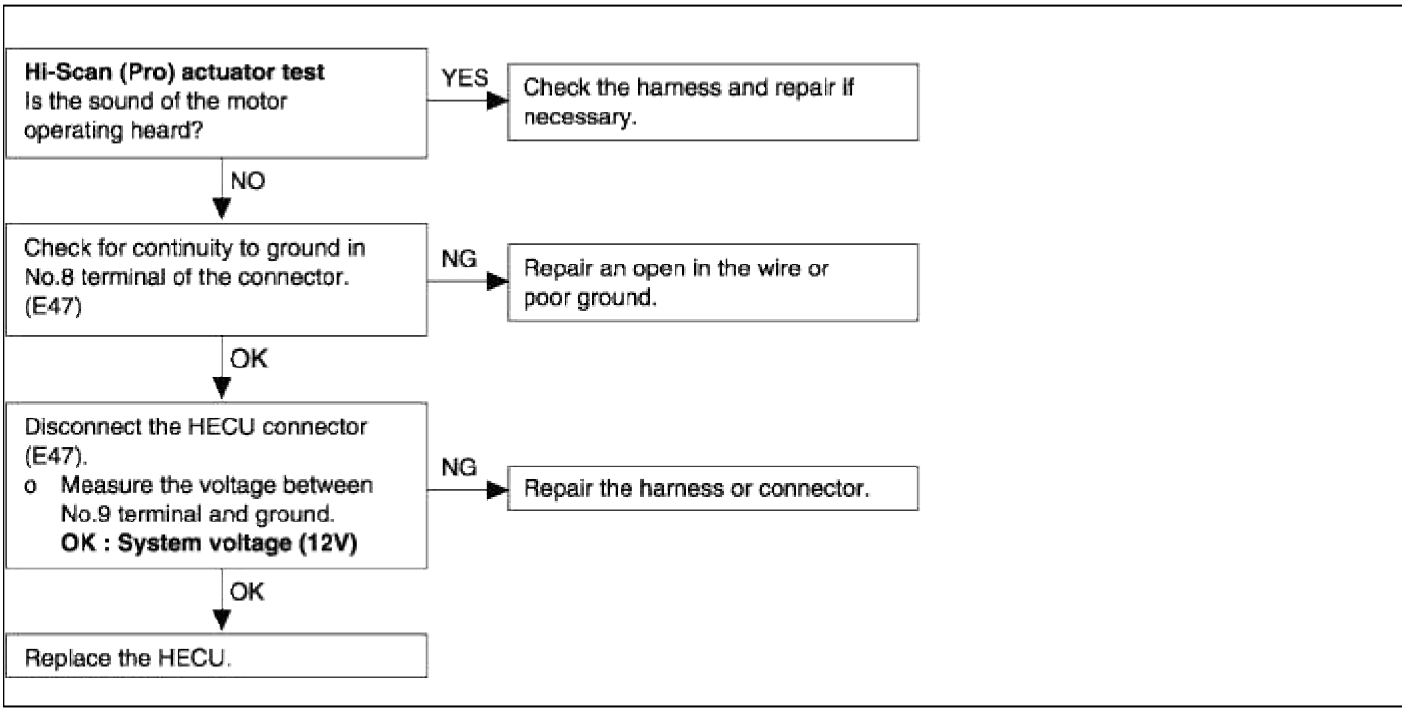
DTC No. C2112 Valve relay error. (Including fuse failure)	Probable cause
When the ignition switch is turned ON, the HECU switches the valve relay on and off during its initial check. During this time, voltage sent to the valve relay is compared to the voltage in the valve power monitor line. If no current is detected in the valve power monitor line, the HECU determines that there is an open circuit and DTC C2112 is recorded.	• Malfunction of wiring harness or connector. • Malfunction of HECU. • Malfunction of valve relay • Poor ground.


ABS fusible link(30A) inspection.
NG
Replace the fusible link.
OK
Measure the voltage between terminal 25 in the HECU connector (E47) and ground.
OK : Battery voltage (12V)
NG
Repair
OK
Check for open or short to ground in the HECU connector (E47) terminal No. 24
NG
Repair
OK
Replace the HECU.

DTC No. C2402 Motor pump error.	Probable cause
When the motor power line is normal but no signal is in detected in the motor monitor line.	• Malfunction of wiring harness or connector. • Malfunction of HECU. • Poor ground.

CAUTION

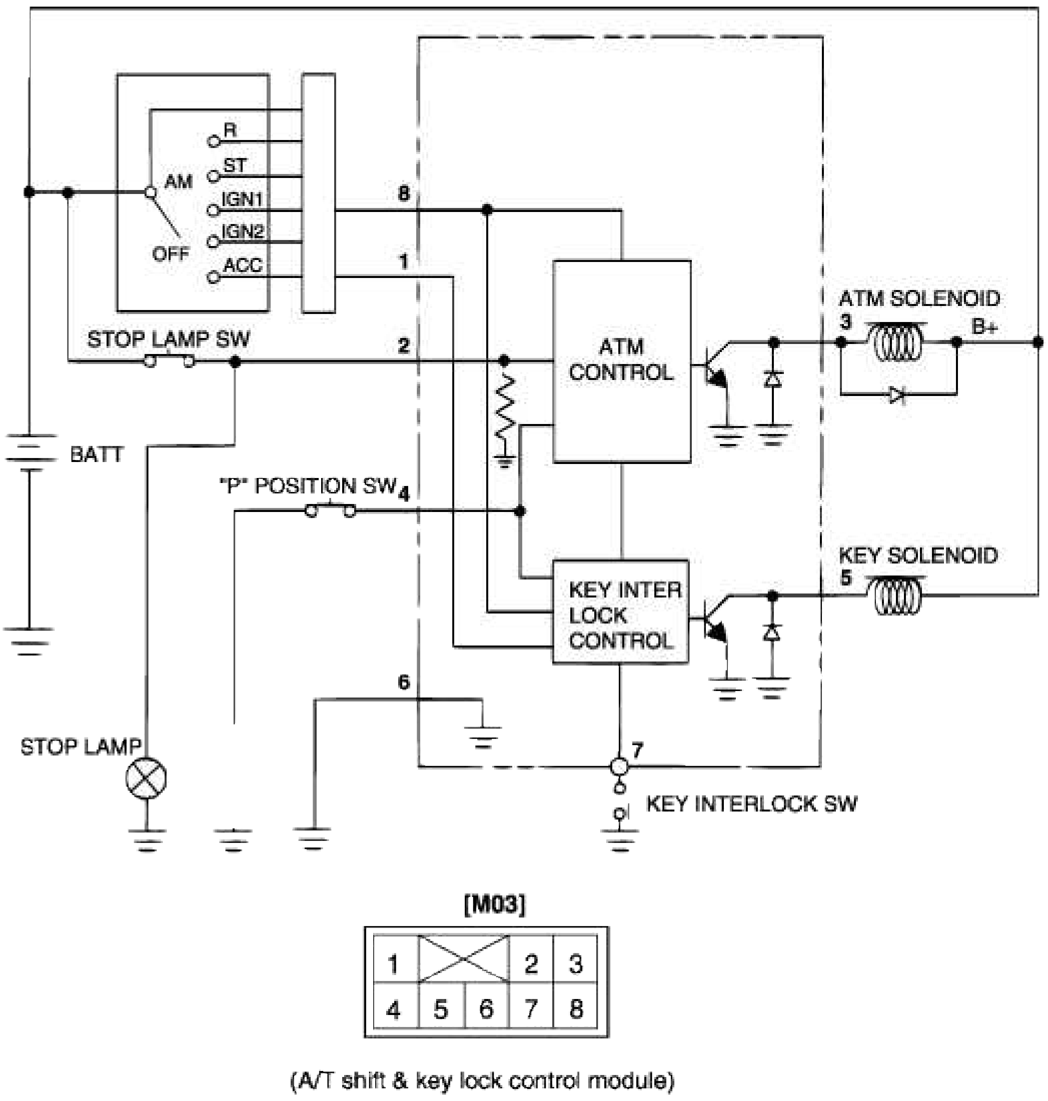
Powering the motor with the Hi-Scan(Pro) will discharge the battery. Start and run the engine for a while after testing is complete.


Hi-Scan (Pro) actuator test
Is the sound of the motor operating heard?
YES
Check the harness and repair if necessary.
NO
Check for continuity to ground in No.8 terminal of the connector. (E47)
NG
Repair an open in the wire or poor ground.
OK
Disconnect the HECU connector (E47).
o Measure the voltage between No.9 terminal and ground.
OK : System voltage (12V)
NG
Repair the harness or connector.
OK
Replace the HECU.

ACCENT(LC) > 2005 > G 1.5 SOHC > Clutch System

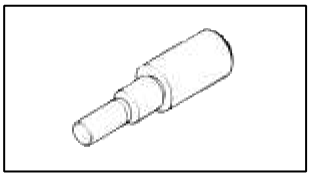
Clutch System > General Information > Schematic Diagrams

CIRCUIT DIAGRAM


R
ST
AM
IGN1
IGN2
OFF
ACC
8
1
2
STOP LAMP SW
BATT
ATM CONTROL
ATM SOLENOID
3
B+
"P" POSITION SW
4
KEY SOLENOID
5
KEY INTER LOCK CONTROL
6
STOP LAMP
7
KEY INTERLOCK SW
[M03]
1
2
3
4
5
6
7
8
(A/T shift & key lock control module)

Clutch System > General Information > Special Service Tools

SPECIAL TOOLS

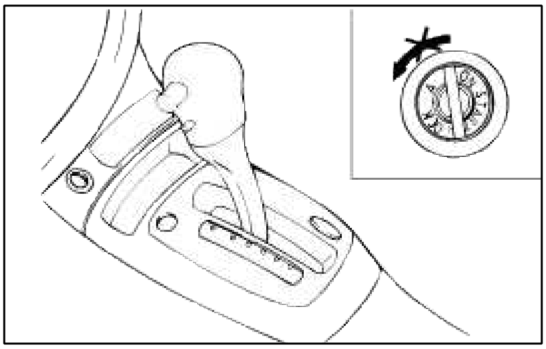
Tool (Number and name)	Illustration	Use
09411-25000 Clutch disc guide		Installation of the clutch disc

Clutch System > General Information > Description and Operation

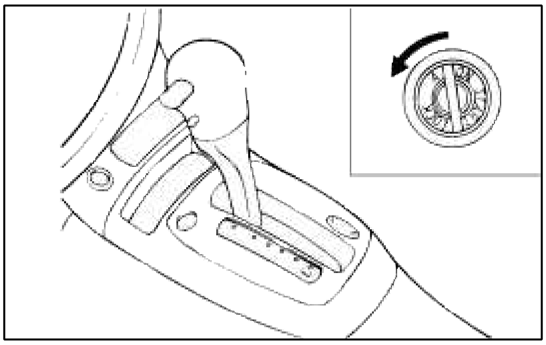
SYSTEM CHECK

KEY LOCK SYSTEM

1. Check that the ignition key cannot be turned to "LOCK (OFF)" position, when the position of the shift lever is not in "P" position.

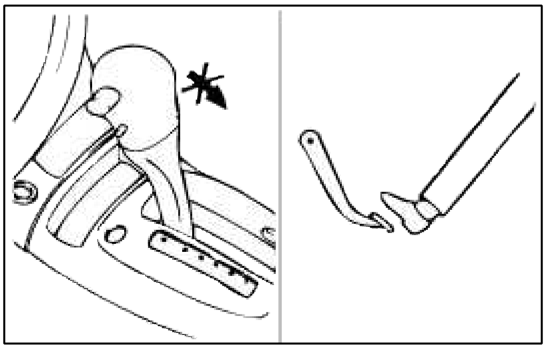


2. Check that the ignition key turns to the "LOCK (OFF)" position, when the shift lever is set to the "P" position.

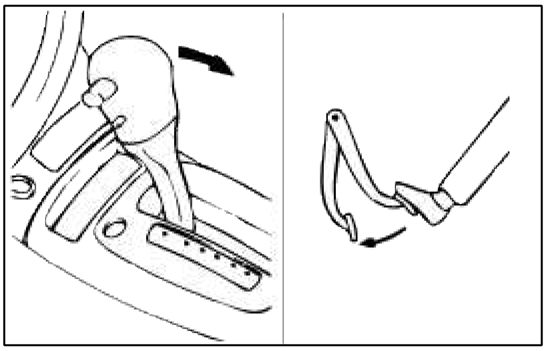


SHIFT LOCK SYSTEM

1. Check that under the following conditions, the shift lever cannot be movedfrom the "P" position to any other position.
   IGNITION KEY POSITION : "ON"
   BRAKE PEDAL : NOT DEPRESSED
   BUTTON : PRESSED

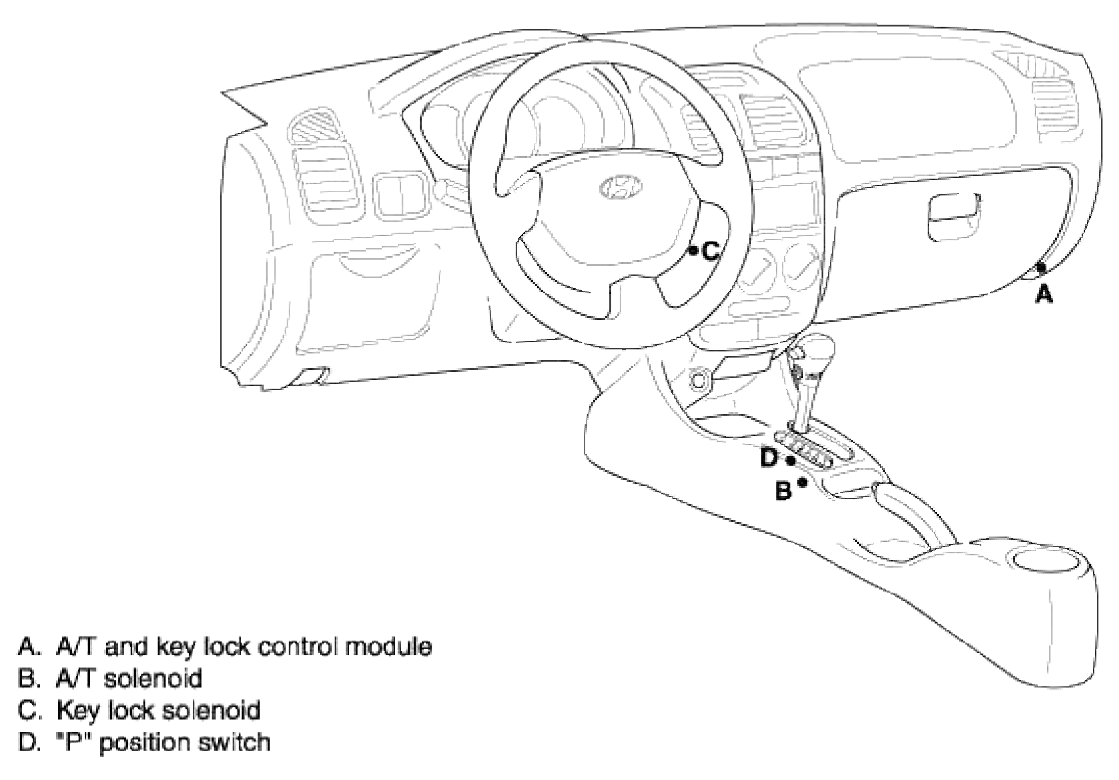


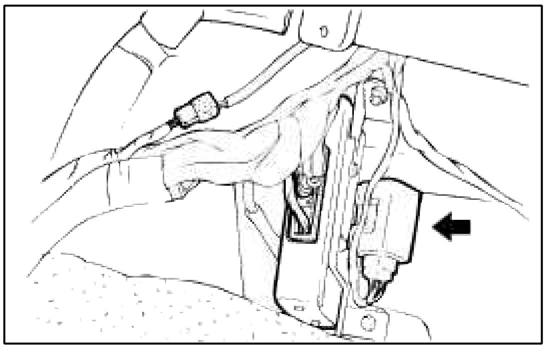
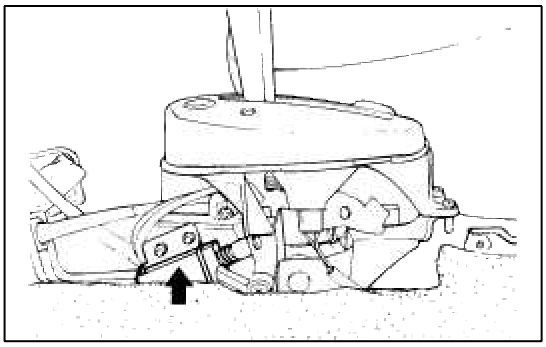
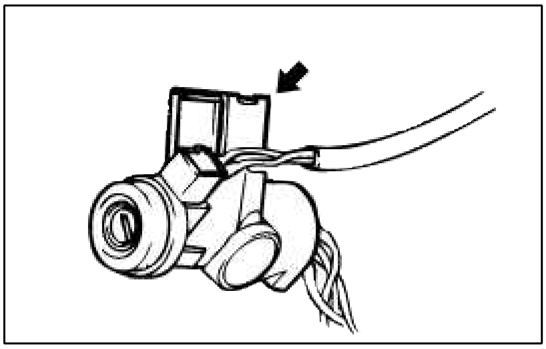
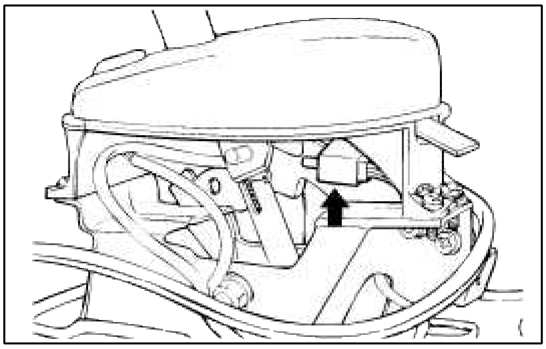
2. Check that under the following conditions, the shift lever can be moved fromthe "P" position to other position.
   IGNITION KEY POSITION : "ON"
   BRAKE PEDAL : DEPRESSED
   BUTTON : PRESSED



Clutch System > General Information > Components and Components Location

COMPONENTS


C
A
D
B
A. A/T and key lock control module
B. A/T solenoid
C. Key lock solenoid
D. "P" position switch

A. A/T and key lock control module	B. A/T solenoid
	
C. Key lock solenoid	D. "P" position switch
	

Clutch System > General Information > Troubleshooting

TROUBLESHOOTING

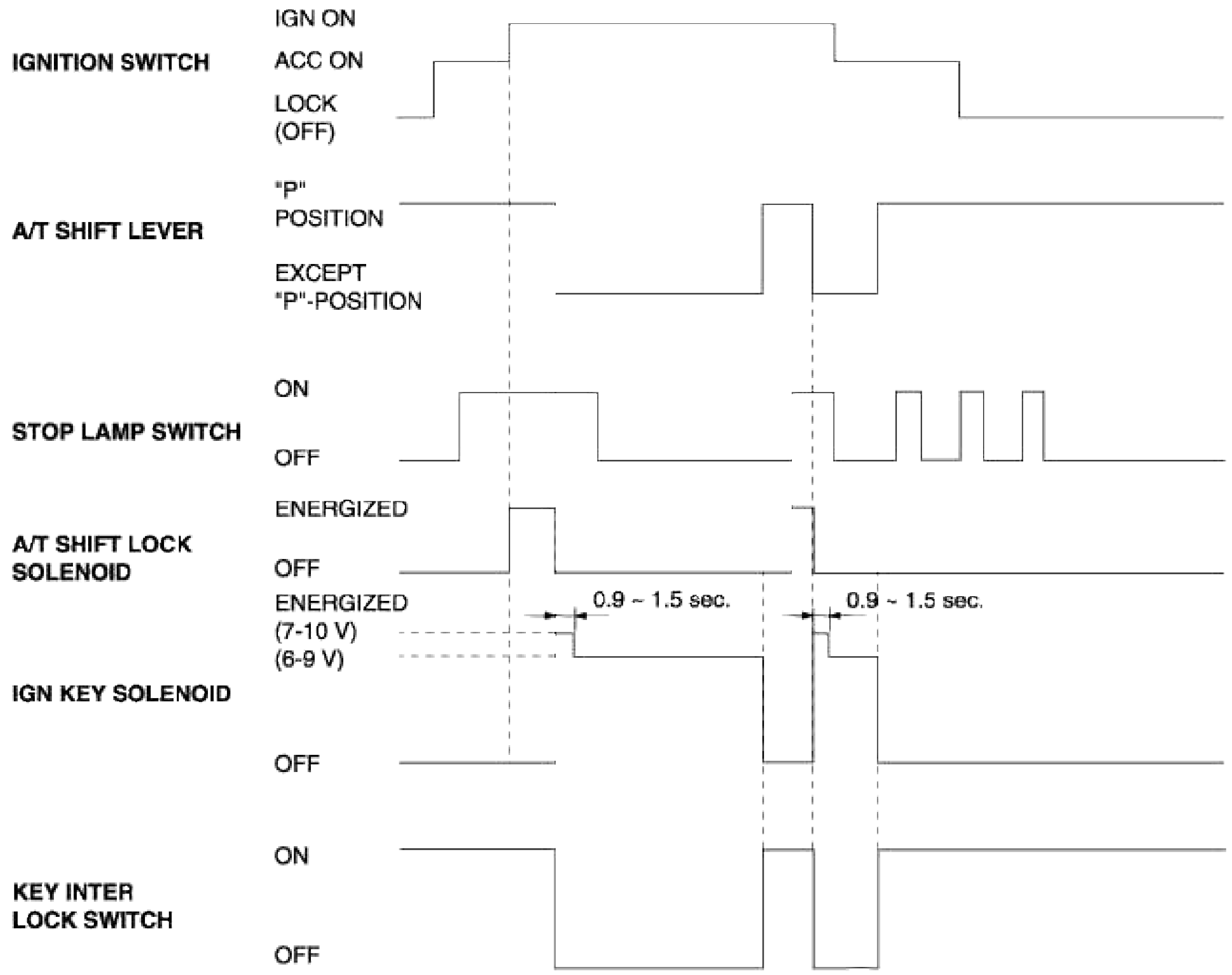
Symptom		Probable cause	Remedy
Clutch slipping • Car will not respond to engine speed during acceleration • Insufficient vehicle speed • Lack of power during uphill driving		Insufficient clutch pedal free play	Adjust
		Clogged hydraulic system	Correct or replace parts
		Excessive wear of clutch disc facing	Replace
		Hardened clutch disc facing, or oil on surface	Replace
		Damaged pressure plate or flywheel	Replace
		Weak or broken pressure spring	Replace
Difficult gear shifting (gear noise during shifting)		Excessive pedal free play	Adjust
		Hydraulic system fluid leaks, air trapping or clogging	Repair or replace parts
		Unusual wear or corrosion of clutch disc spline	Replace
		Excessive vibration (distortion) of clutch disc	Replace
Clutch noisy	When clutch is not used	Insufficient play of clutch pedal	Adjust
		Excessive wear of clutch disc facing	Replace
	A noise is heard after clutch is disengaged	Unusual wear and/or damage of release bearing	Replace
	A noise is heard when clutch is disengaged	Insuffcient grease on the sliding surface of bearing sleeve	Repair
		Improperly installed clutch assembly or bearing	Repair
	A noise is heard when car is suddenly rolled with clutch partially engaged	Damaged pilot bushing	Replace
Difficult to depress clutch pedal		Insufficient lubrication of clutch pedal	Repair
		Insufficient lubrication of the clutch disc spline	Repair
		Insufficient lubrication of the clutch release lever shaft	Repair
		Insufficient lubrication of front bearing retainer	Repair
Difficult to shift gear or cannot shift at all		Excessive clutch pedal free play excessive	Adjust pedal free play
		Clutch release cylinder faulty	Repair release cylinder
		Clutch disc out of true, runout is excessive or lining broken	Inspect clutch disc
		Spline on input shaft or clutch disc dirty or burred	Repair as necessary
		Clutch pressure plate faulty	Replace clutch cover
Clutch slips		Clutch pedal free play insufficient	Adjust pedal free play
		Clogged hydraulic system	Repair or replace parts
		Clutch disc lining oily or worn out	Inspect clutch disc
		Pressure plate faulty	Replace clutch cover
		Release fork binding	Inspect release fork
Clutch grabs/chatters		Clutch disc lining oily or worn out	Inspect clutch disc
		Pressure plate faulty	Replace clutch cover
		Clutch diaphragm spring bent	Replace clutch cover

	Worn or broken torsion spring Engine mounts loose	Replace clutch disc Repair as necessary
Clutch noisy	Damaged clutch pedal bushing Loose part inside housing Release bearing worn or dirty Release fork or linkage sticks	Replace clutch pedal bushing Repair as necessary Replace release bearing Repair as necessary

Clutch System > General Information > Repair procedures

INSPECTION

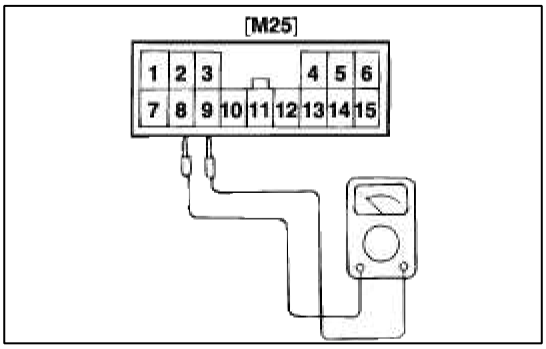
TIMMING CHART


IGNITION SWITCH
IGN ON
ACC ON
LOCK (OFF)
A/T SHIFT LEVER
"P" POSITION
EXCEPT "P"-POSITION
STOP LAMP SWITCH
ON
OFF
A/T SHIFT LOCK SOLENOID
ENERGIZED
OFF
IGN KEY SOLENOID
ENERGIZED
(7-10 V)
(6-9 V)
OFF
0.9 ~ 1.5 sec.
0.9 ~ 1.5 sec.
KEY INTER LOCK SWITCH
ON
OFF

A/T SHIFT LOCK SOLENOID

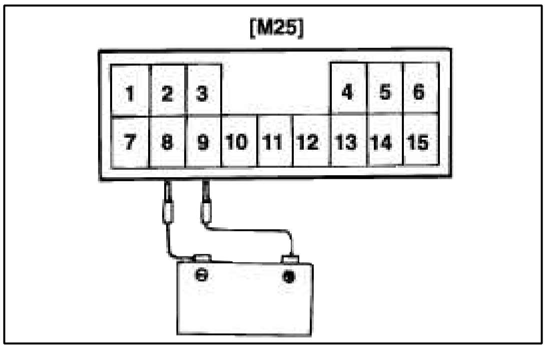
1. Remove the solenoid connector.

2. Using an ohmmeter, measure the resistance between terminals.


[M25]
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15

Standard resistance : 12-16Ω

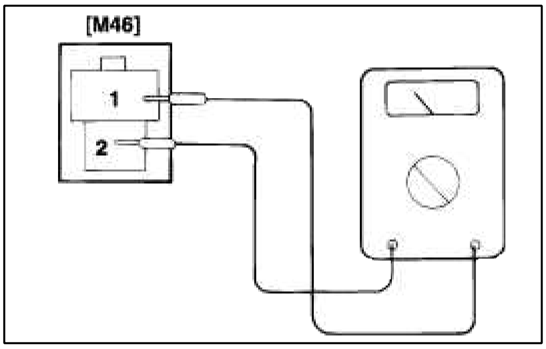
3. Attach the positive (+) lead from the battery to terminal #9. and the negative (-) lead to terminal #8.


[M25]
1 2 3 4 5 6
7 8 9 10 11 12 13 14 15
⊖ ⊕

4. Check that an operation noise can be heard from the solenoid.

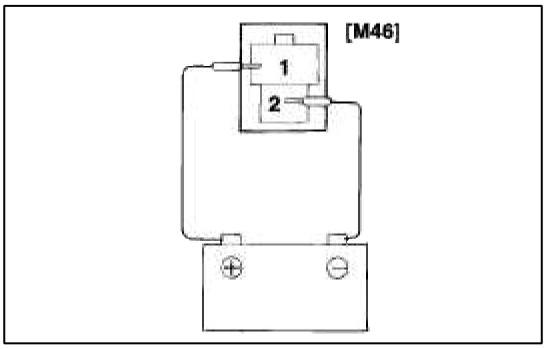
A/T KEY INTERLOCK SOLENOID

1. Remove the solenoid connector.
2. Using an ohmmeter, measure the resistance between terminals.



Standard resistance : 12-16Ω

3. Attach the positive (+) lead from the battery to terminal #2. and the negative (-) lead to terminal #1.



4. Check that an operation noise can be heard from the solenoid.

Clutch System > General Information > Specifications

GENERAL

SPECIFICATIONS

Item	Specifications
Clutch operating method	Hydraulic type
Clutch disc	
Type	Single dry with diaphragm.
Facing diameter (Outside x Inside) mm	1.5SOHC : 250 x 130 1.6DOHC : 215 x 145
Clutch cover assembly	
Type	Diaphragm spring strap
Clutch release cylinder	
I.D. mm (in.)	20.64 (0.81)
Clutch master cylinder	
I.D. mm (in.)	15.57 (0.62)

I.D. : Inside Diameter

SERVICE STANDARD

Item	Standard value
Clutch disc thickness [When free]	8.4 ± 0.3
Clutch pedal free play	6 ~ 13 (0.24 ~ 0.52)
Clutch pedal height	166.7 (6.6)
Clutch pedal stroke	145 (5.6)

TIGHTENING TORQUE

Item	Nm	kg·cm	lb·ft
Clutch pedal to pedal support member	19 ~ 28	180 ~ 280	13 ~ 20
Clutch pedal support member to master cylinder	8 ~ 10	80 ~ 100	6 ~ 7
Clutch tube flare nut	13 ~ 17	130 ~ 170	9 ~ 13
Clutch tube bracket	4 ~ 6	40 ~ 60	3 ~ 4
Clutch release cylinder mounting bolt	15 ~ 22	150 ~ 220	11 ~ 16
Clutch release cylinder union bolt	25	250	18
Clutch cover assembly	15 ~ 22	150 ~ 220	11 ~ 16
Clutch master cylinder push rod nut	9 ~ 14	90 ~ 140	6 ~ 10
Ignition lock nut	8 ~ 10	80 ~ 100	6 ~ 7
Master cylinder reservior band	5 ~ 7	50 ~ 70	3 ~ 5

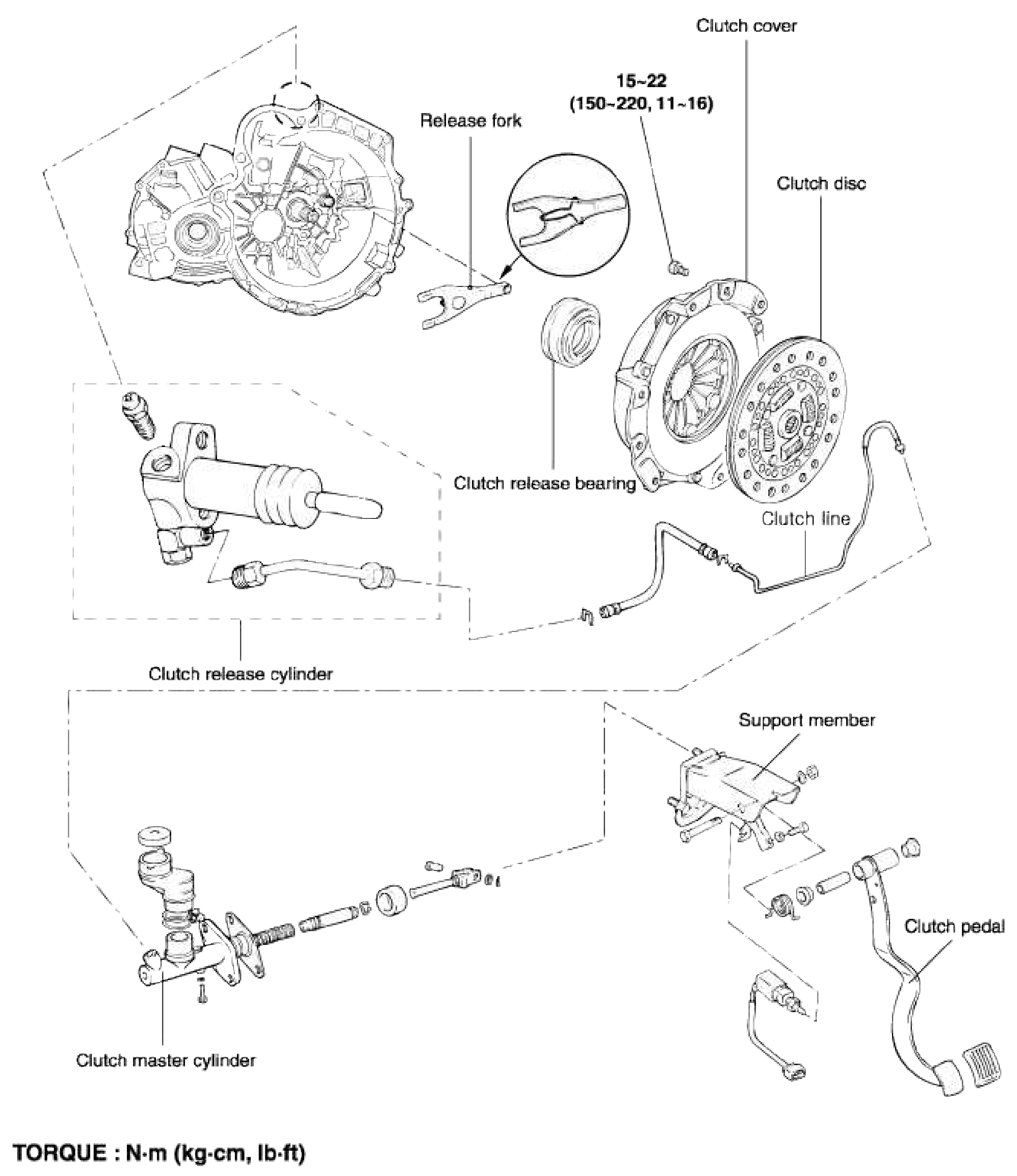
LUBRICANTS

Items	Specified lubricants	Quantity
Contact surface of release bearing and fulcrum of clutch release fork	CASMOLY L9508	As required
Inner surface of clutch release bearing	CASMOLY L9508	As required
Inner surface of clutch release cylinder and outer circumference of piston and cup	Brake fluid DOT3 or DOT4	As required
Inner surface of clutch disc spline	CASMOLY L9508	As required
Inner surface of clutch master cylinder and outer circumference of piston assembly	Brake fluid DOT3 or DOT4	As required
Clutch master cylinder push rod, clevis pin and washer	Wheel bearing grease SAE J310a, NLGI No.2	As required
Clutch pedal shaft and bushings	SAE J310a, Chassis grease, NLGI-No.1	As required
Contact portion of release fork to release cylinder push rod	CASMOLY L9508	As required

Clutch System > Clutch System > Components and Components Location

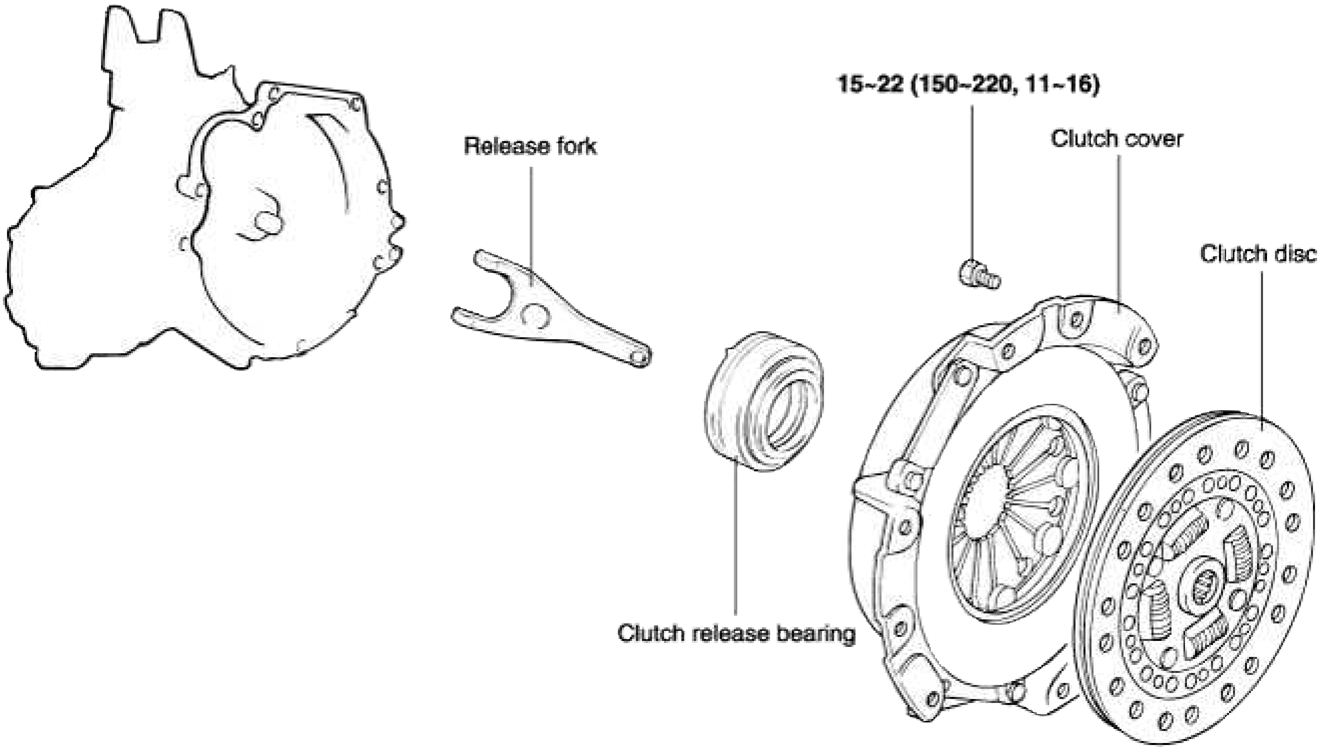
CLUTCH CONTROL

COMPONENTS


Clutch cover
15~22
(150~220, 11~16)
Release fork
Clutch disc
Clutch release bearing
Clutch line
Clutch release cylinder
Support member
Clutch pedal
Clutch master cylinder
TORQUE : N·m (kg-cm, lb·ft)

Clutch System > Clutch System > Clutch Cover And Dinode > Components and Components Location

COMPONENTS

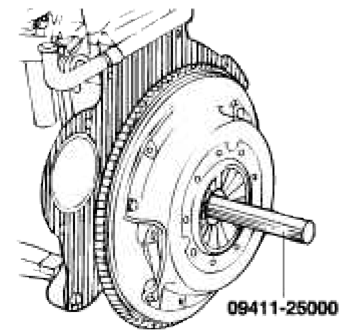

15~22 (150~220, 11~16)
Release fork
Clutch cover
Clutch disc
Clutch release bearing

TORQUE : Nm (kg·cm,lb·ft)

Clutch System > Clutch System > Clutch Cover And Dinode > Repair procedures

REMOVAL

1. Drain the clutch fluid and transaxle gear oil.
2. Remove the transaxle assembly. (Refer to the "TR" group)
3. Insert the special tool (09411-25000) in the clutch disc to prevent the disc from falling.

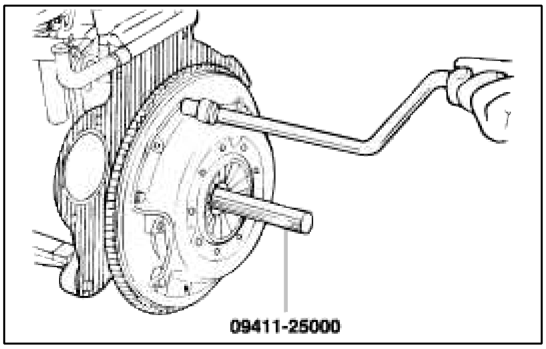

09411-25000

4. Loosen the bolts that attach the clutch cover to the flywheel in a star pattern.

5. Loosen the bolts in succession, one or two turns at a time, to avoid bending the cover flange.

CAUTION

DO NOT clean the clutch disc or release bearing with cleaning solvent.



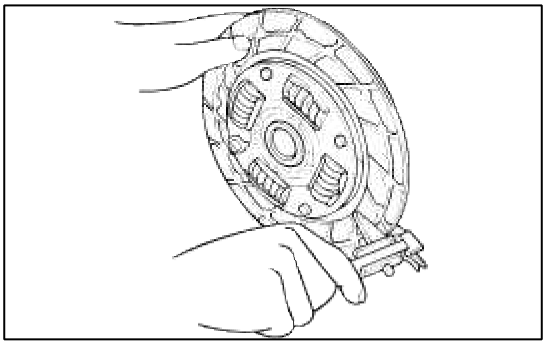
INSPECTION

CLUTCH COVER ASSEMBLY

1. Check the diaphragm spring end for wear and uneven height.
2. Check the pressure plate surface for wear, cracks and color change.
3. Check the rivets for looseness and replace the clutch cover assembly if necessary.

CLUTCH DISC

1. Check the clutch facing for loose rivets, uneven contact, deterioration due to seizure, adhesion of oil, or grease, and replace the clutch disc if defective.
2. Measure the thickness of the disc when free.



3. Check for the torsion spring play and damage and if defective, replace the clutch disc.
4. Clean the splines on the input shaft and install the clutch disc.
   If the disc does not slide smoothly or if play is excessive, replace the clutch disc and/or the input shaft.

CLUTCH RELEASE BEARING

CAUTION

The release bearing is packed with grease. Do not use cleaning solvent or oil.

1. Check the bearing for seizure, damage or abnormal noise. Also check the diaphragm spring contacting points for wear.
2. Replace the bearing if the release fork contacting points are worn abnormally.

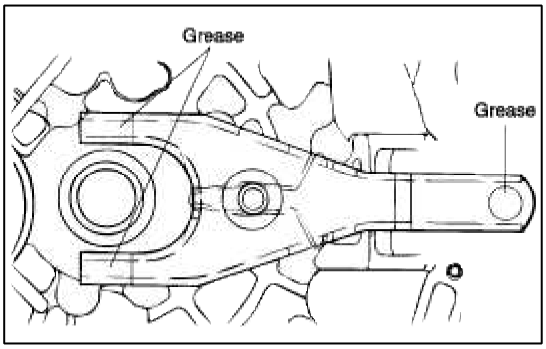
CLUTCH RELEASE FORK

INSTALLATION

1. Apply multipurpose grease to the release bearing contact surfaces and the release cylinder contact surface of the clutch release fork assembly.

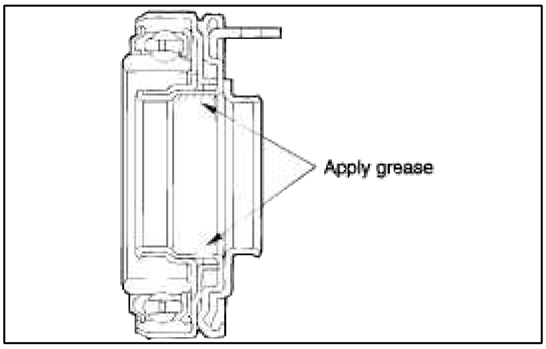
CAUTION

When installing the clutch, apply grease to each part, but be careful not to apply excessive grease. It can cause clutch slippage and judder.



2. Apply multipurpose grease into the groove of the release bearing.

Grease : CASMOLY L9508



3. Apply multipurpose grease to the clutch release lever fulcrum contact surface of the clutch release fork assembly.

Grease : CASMOLY L9508

4. Clean the surfaces of the flywheel and pressure plate thoroughly with fine sandpaper or crocus cloth, and make certain that all oil or grease has been removed.
5. Apply a small amount of multipurpose grease to the clutch disc splines and input shaft splines.

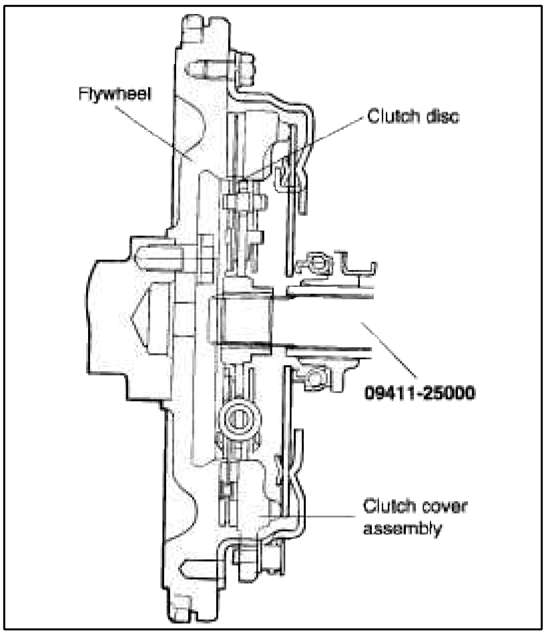
Grease : CASMOLY L9508

CAUTION

Do not apply more grease than necessary. Too much grease can cause clutch slip or judder.

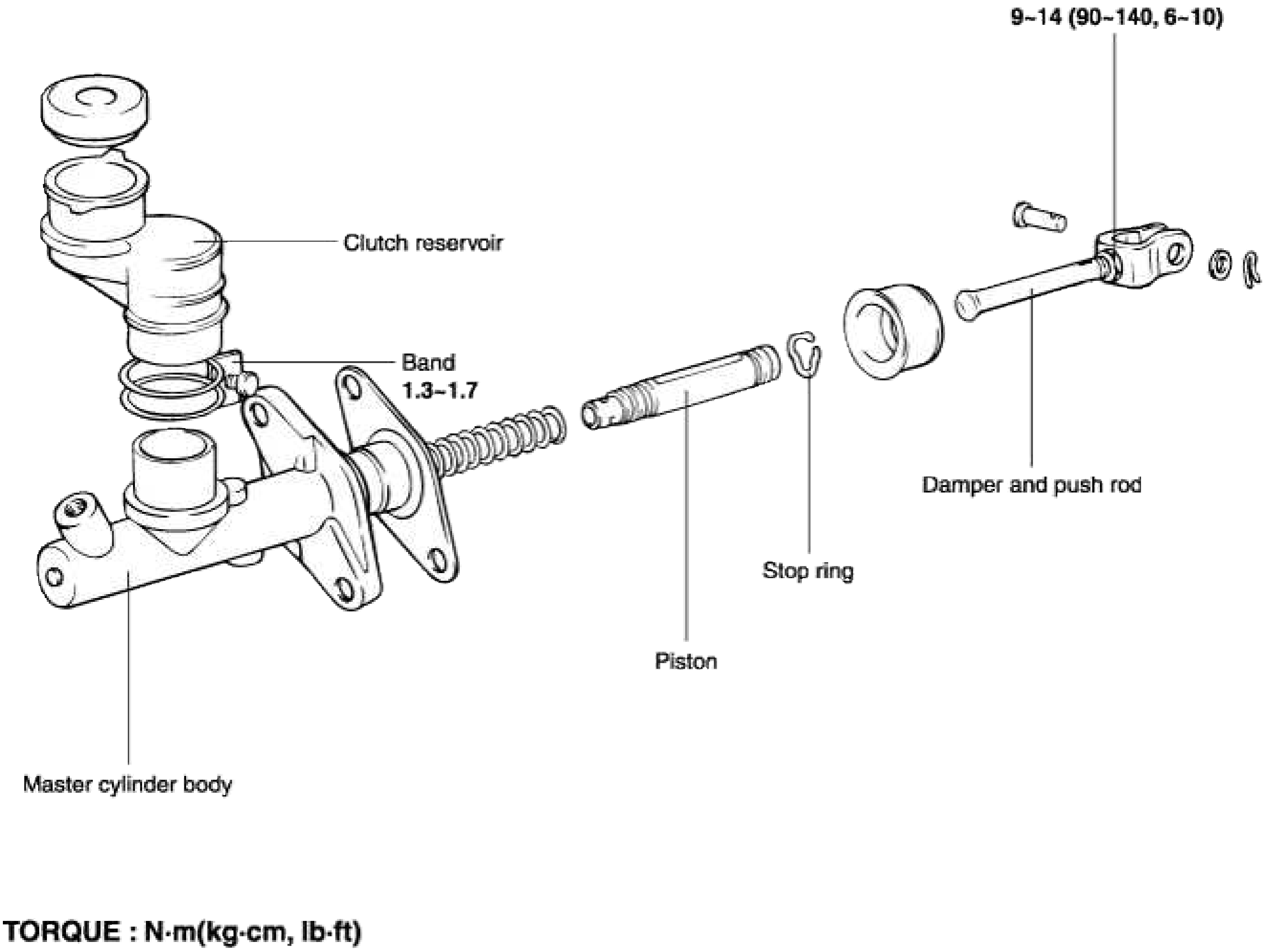
6. Using the special tool (09411-25000), install the clutch disc to the flywheel. When installing the clutch disc, be sure that the surface having the manufactures stamp is towards the pressure plate.
7. Install the the clutch cover assembly onto the flywheel and install the six (6) bolts through the clutch cover into the flywheel.
8. Diagonally tighten the bolts 15-22 Nm (150-220 kg·cm, 11-15 lb·ft).
   Tighten the bolts by one or two turns at a time, in succession, to avoid bending the cover flange.
9. Remove the special tool.
10. Install the transaxle. (Refer to the "TR" group.)

11. Adjust the clutch pedal free-play.


Flywheel
Clutch disc
09411-25000
Clutch cover assembly

Clutch System > Clutch System > Clutch Master Cylinder > Components and Components Location

COMPONENTS


9~14 (90~140, 6~10)
Clutch reservoir
Band
1.3~1.7
Damper and push rod
Stop ring
Piston
Master cylinder body
TORQUE : N·m(kg·cm, lb·ft)

Clutch System > Clutch System > Clutch Master Cylinder > Repair procedures

DISASSEMBLY

1. Remove the piston stop ring.
   (Refer to the components of the master cylinder)
2. Pull out the push rod and piston assembly.

> **NOTE**
>
> Be careful not to damage the master cylinder body and piston assembly.

INSPECTION

1. Check the inside of the cylinder body for rust, pitting or scoring.
2. Check the piston cup for wear or distortion.
3. Check the piston for rust, pitting or scoring.
4. Check the clutch tube line for obstructions.
5. Measure the clutch master cylinder inside diameter with a cylinder gauge, and the piston outside diameter with a micrometer.

REASSEMBLY

1. Apply the specified fluid to the inner surface of the cylinder body and to the outside of the piston assembly.

Specified fluid : BRAKE FLUID DOT 3 or DOT4

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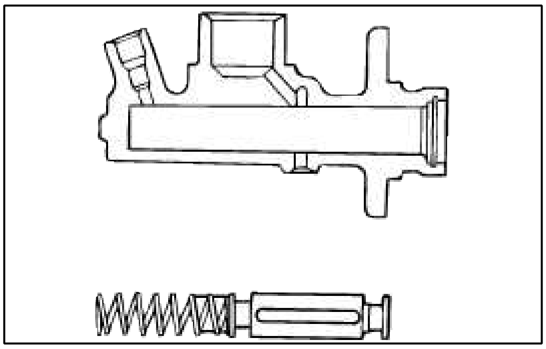
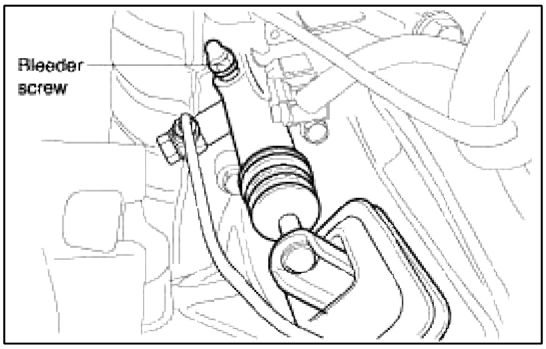
2. Install the piston assembly.
3. Install the piston stop ring
4. Install the push rod assembly. (Refer to the components of the clutch master cylinder.)



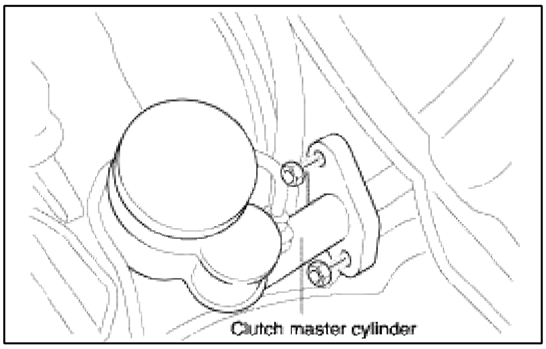
5. Install the clutch hose on the cylinder body.

REMOVAL

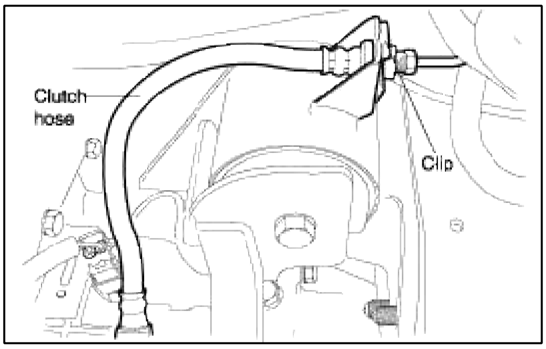
1. Drain the clutch fluid through the bleeder screw.

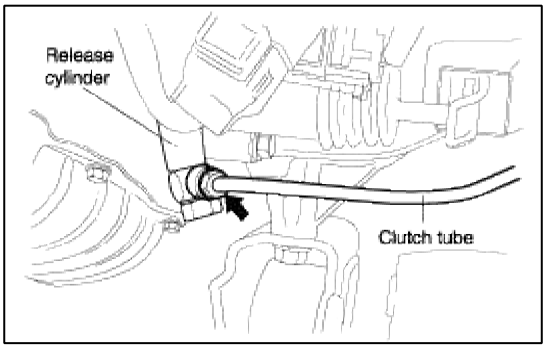


2. Remove the master cylinder mounting nut.

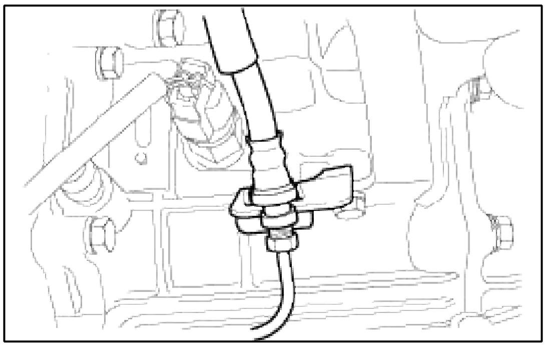

Clutch master cylinder

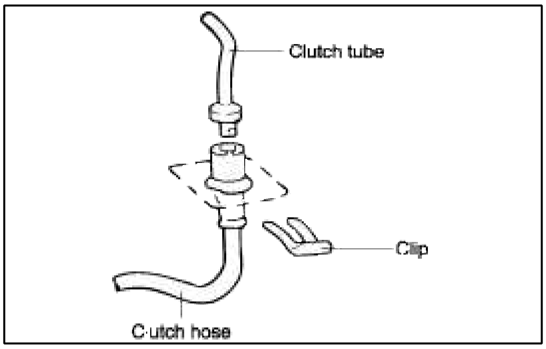
3. Separate the clutch line.


Clutch hose
Clip


Release cylinder
Clutch tube

4. Remove the clutch line clip of the transaxle side.

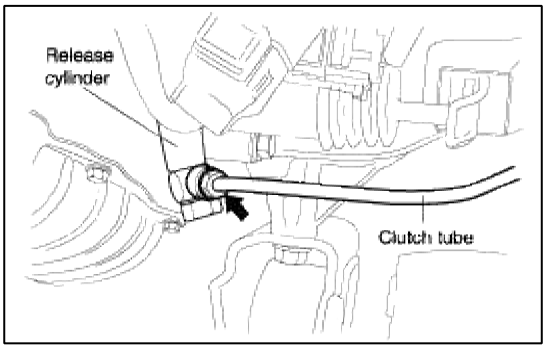



Clutch tube
Clip
C·utch hose

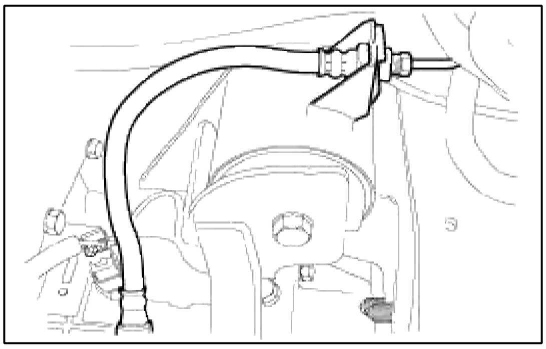
INSPECTION

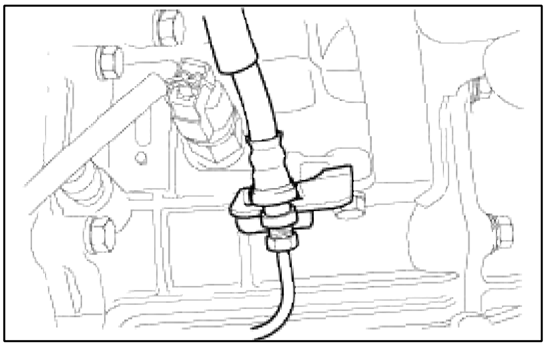
INSTALLATION

1. Install the clutch tube (clutch release cylinder side).

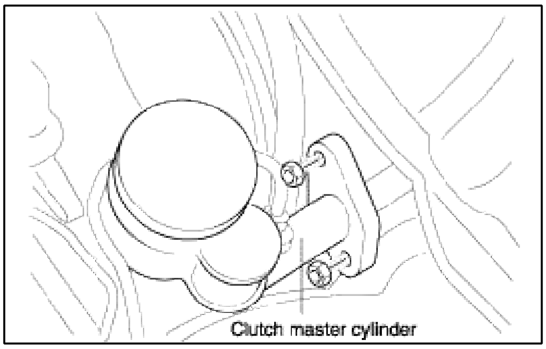

Release cylinder
Clutch tube

2. Install the clutch line and the clip.





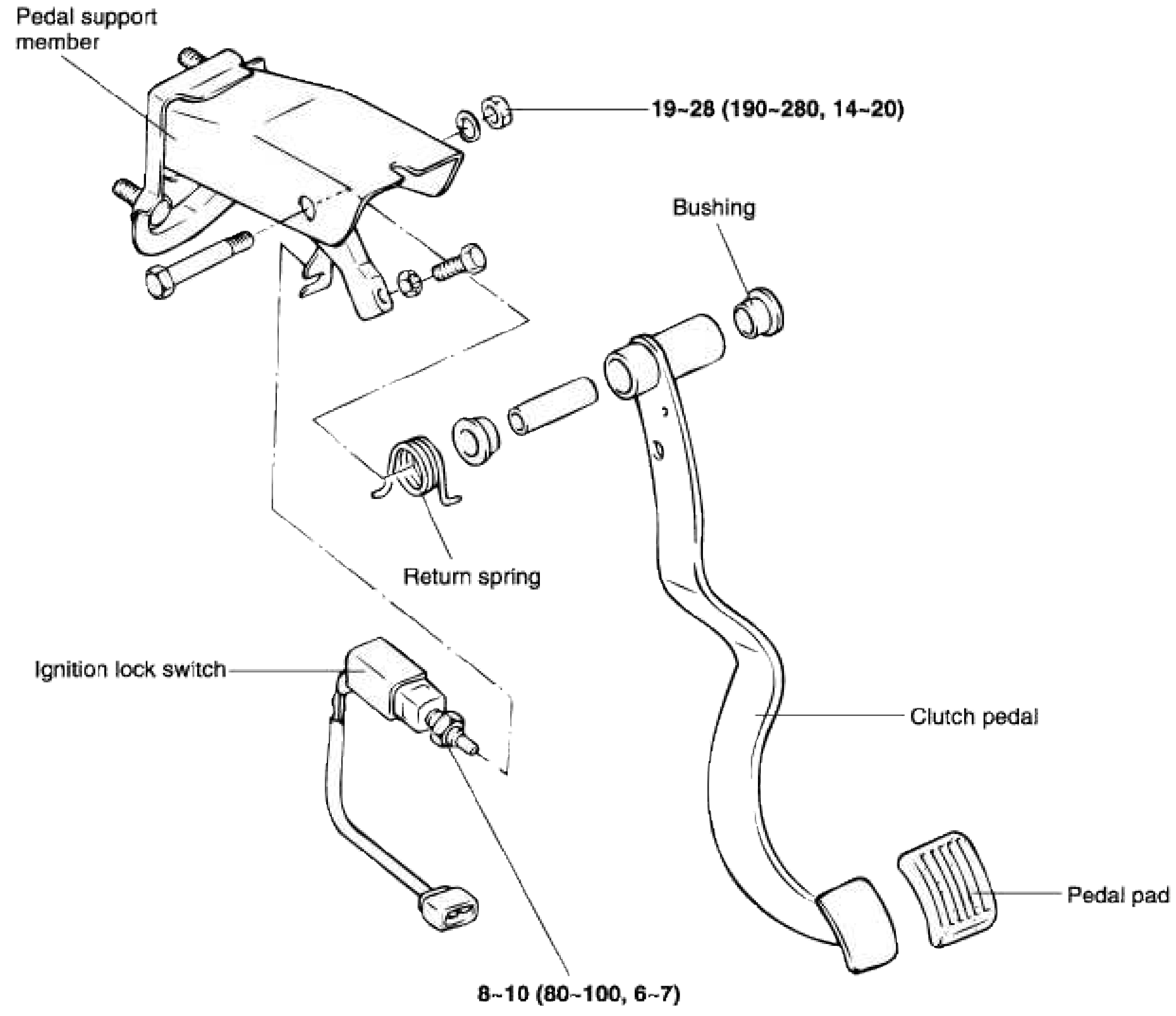
3. Install the clutch master cylinder.


Clutch master cylinder

4. Install the push rod to the clutch pedal.
5. Bleed the system.

Clutch System > Clutch System > Clutch Pedal > Components and Components Location

COMPONENTS

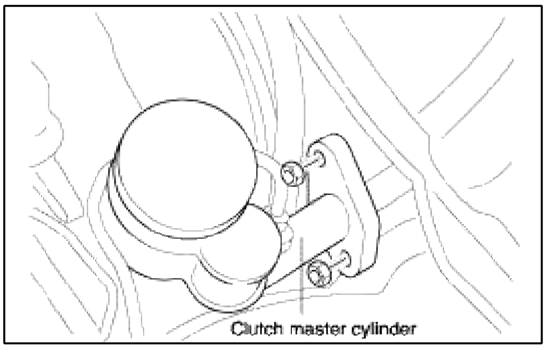

Pedal support member
19~28 (190~280, 14~20)
Bushing
Return spring
Ignition lock switch
Clutch pedal
Pedal pad
8~10 (80~100, 6~7)

TORQUE : Nm (kg·cm, lb·ft)

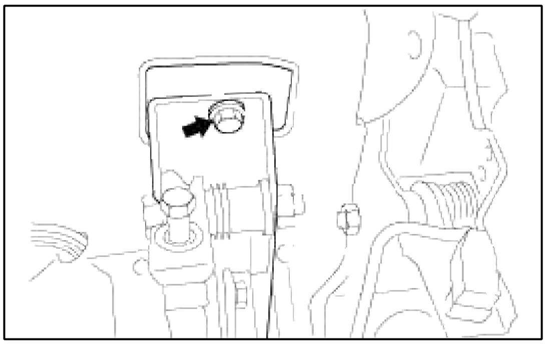
Clutch System > Clutch System > Clutch Pedal > Repair procedures

REMOVAL

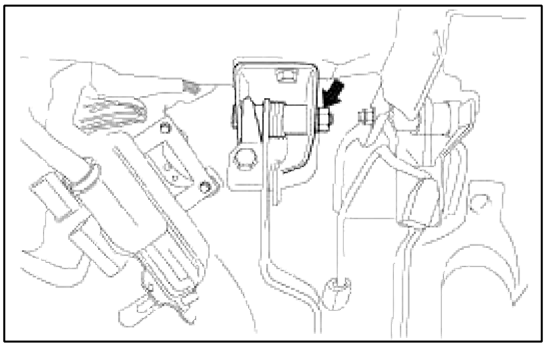
1. Remove the master cylinder mounting nut.



2. Remove the pedal support member mounting bolt.



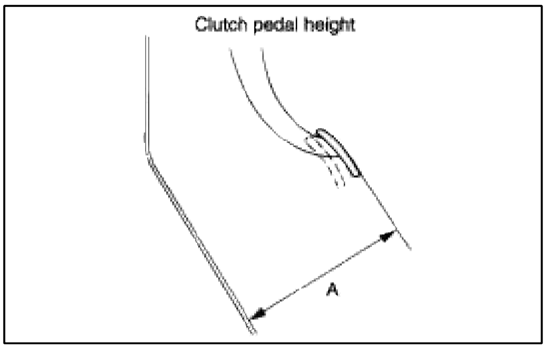
3. Remove the pedal support bolt.



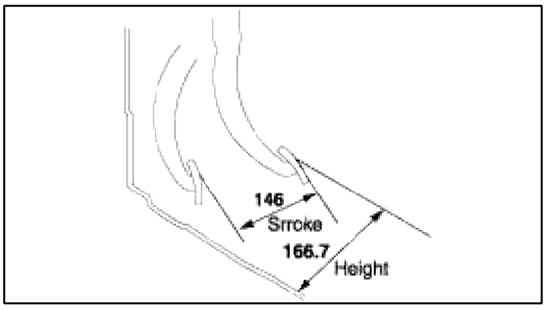
INSPECTION

1. Check the clutch pedal shaft and bushing for wear.
2. Check the clutch pedal for bending or distortion.
3. Check the return spring for damage or deterioration.
4. Check the clutch pedal pad for damage or wear.
5. Measure the clutch pedal height (from the face of the pedal pad to the floorboard).

Standard value : (A) 166.7 mm (6.6 in.)



6. If the clutch pedal height is not within the standard value range, adjust as follows :
   A. Turn and adjust the bolt, then secure by tightening the lock nut.



> **CAUTION**
>
> After the adjustment, tighten the bolt until it reaches the pedal stopper and tighten the lock nut.

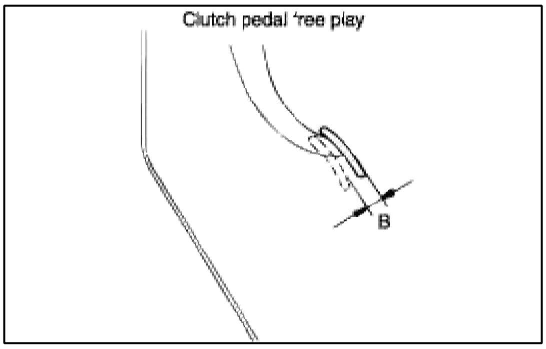
   B. Turn the push rod to agree with the standard value and secure the push rod with the lock nut.

> **CAUTION**
>
> When adjusting the clutch pedal height, be careful not to push the push rod toward the master cylinder.

7. After completing the adjustments, check that the clutch pedal free play (measured at the face of the pedal pad) is within the standard value ranges.

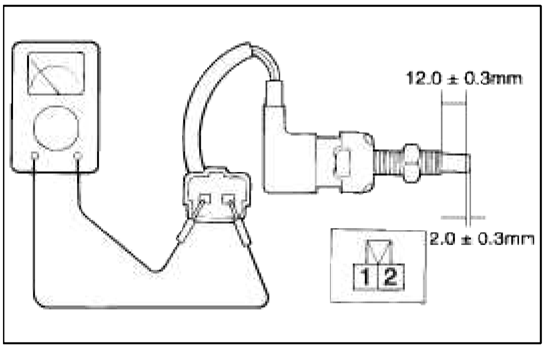
Standard value : (B) 6~13 mm (0.24~0.52 in.)

8. If the clutch pedal free play does not meet the standard value, it may be the result of air in the hydraulic system or a faulty clutch master cylinder. Bleed the air or disassemble and inspect the master cylinder or clutch.



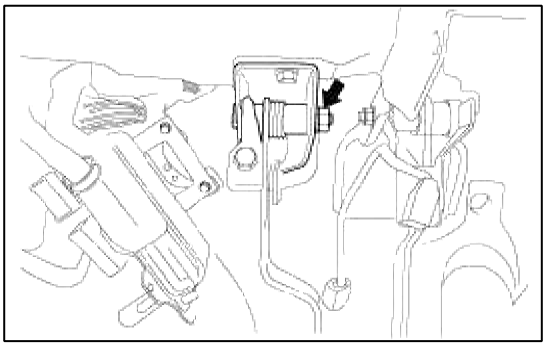
IGNITION LOCK SWITCH INSPECTION

Terminal / Condition	1	2
Pushed	○	○
Free		



INSTALLATION

1. Apply the multi-purpose grease and install the pedal support bolt.



Specified lubricants :
SAE J310a, Chassis grease, NLGI-No.1

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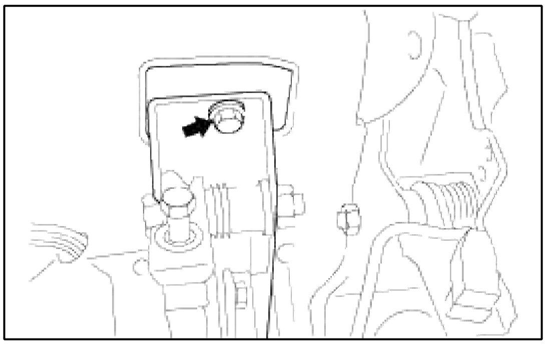
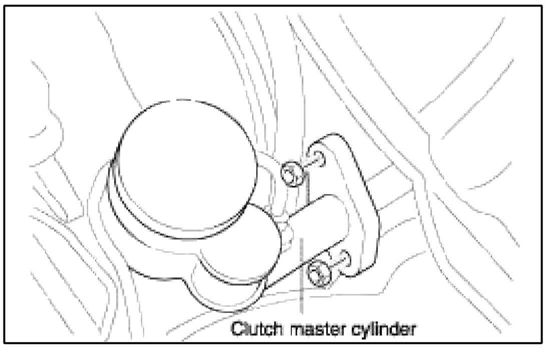
2. Install the pedal supprot member mounting bolt.

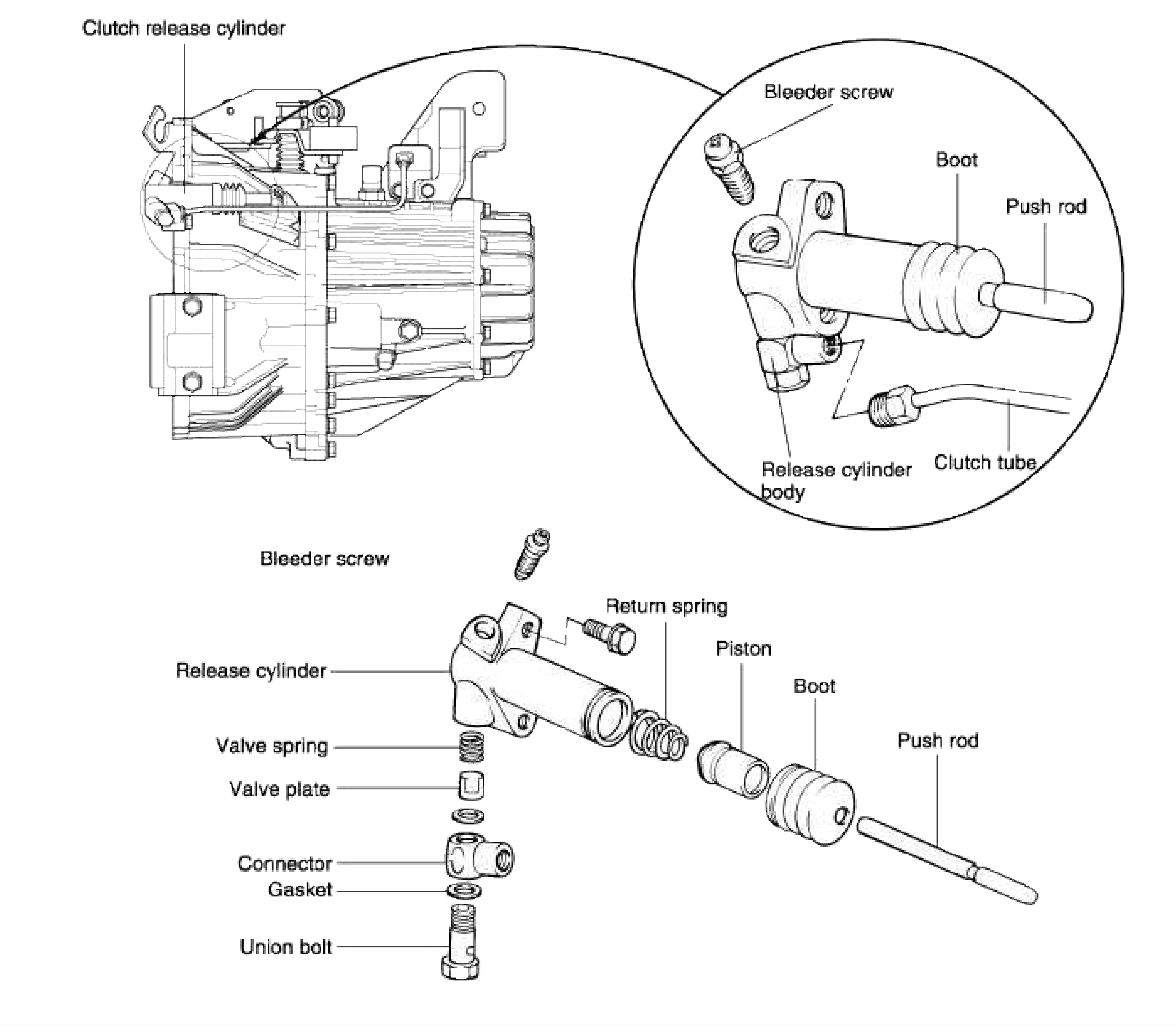


3. Install the master cylinder mounting nut.



Clutch System > Clutch System > Clutch Release Cylinder > Components and Components Location

COMPONENTS


Clutch release cylinder
Bleeder screw
Boot
Push rod
Release cylinder body
Clutch tube
Bleeder screw
Return spring
Piston
Boot
Push rod
Release cylinder
Valve spring
Valve plate
Connector
Gasket
Union bolt

Clutch System > Clutch System > Clutch Release Cylinder > Repair procedures

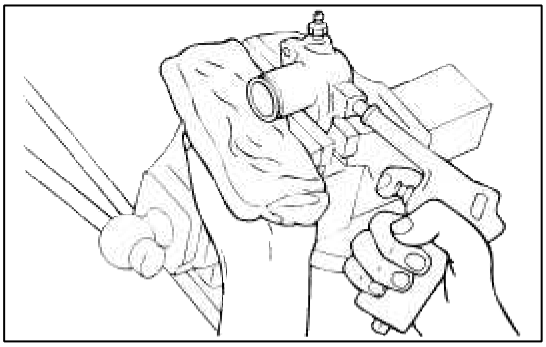
DISASSEMBLY

1. Remove the clutch hose, valve plate, spring, push rod and boot.
2. Remove any dirt from the piston bore opening of the release cylinder.

3. Remove the piston from the release cylinder using compressed air.

CAUTION

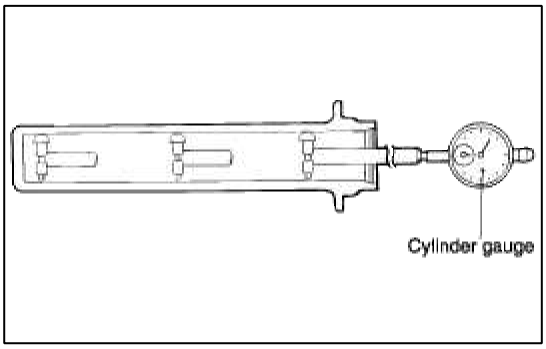
1. Cover the release cylinder with rags to prevent the piston from popping out and causing injury.
2. Apply compressed air slowly to prevent the fluid from splashing in your eyes or on your skin.



INSPECTION

1. Check the release cylinder bore for rust and damage.
2. Measure the release cylinder bore at three locations: bottom, middle and top with a cylinder gauge. Replace the release cylinder assembly if the bore-to-piston clearance exceeds the limit.

Limit : 0.15 mm (0.006 in.)

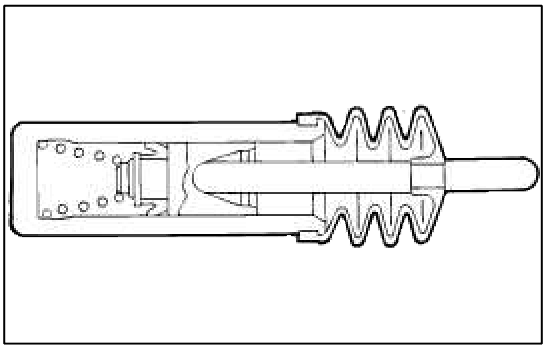


REASSEMBLY

1. Apply specified brake fluid to the release cylinder bore and the outer surface of the piston and piston cup. Push the piston cup assembly into the cylinder.

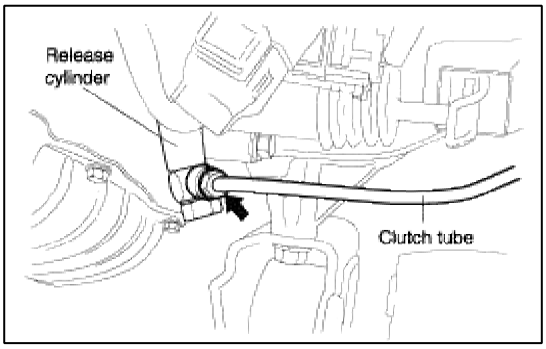
Use the specified fluid : Brake fluid DOT 3 or DOT 4

2. Install the valve plate, push rod and boot.

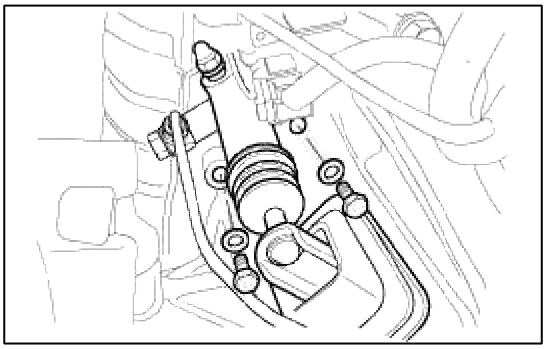


REMOVAL

1. Disconnect the clutch tube.


Release cylinder
Clutch tube

2. Remove the clutch release cylinder mounting bolt.



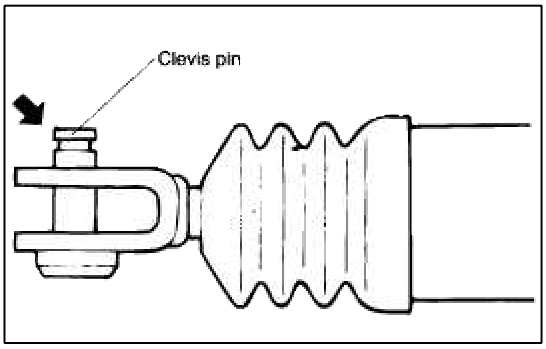
INSPECTION

1. Check the clutch release cylinder for fluid leakage.
2. Check the clutch release cylinder boots for damage.

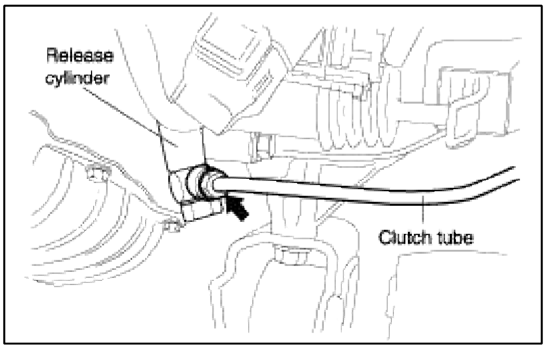
INSTALLATION

1. Coat the clevis pin with the specified grease.

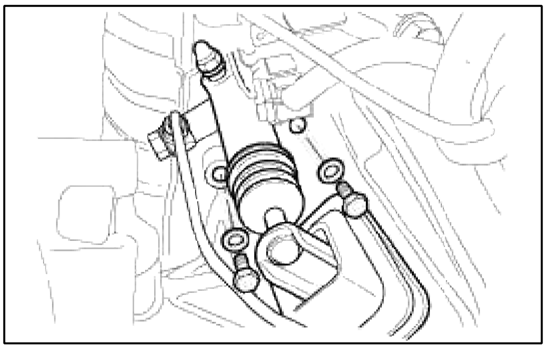
Specified grease : CASMOLY L9508



2. Install the clutch release cylinder, and the clutch tube.


Release cylinder
Clutch tube

3. Install the clutch release cylinder mounting bolt.



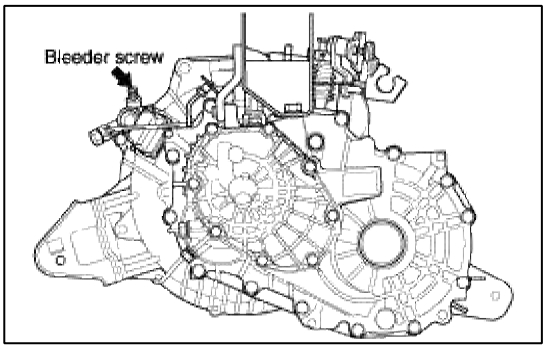
Clutch System > Clutch System > Repair procedures

INSPECTION

BLEEDING

CAUTION

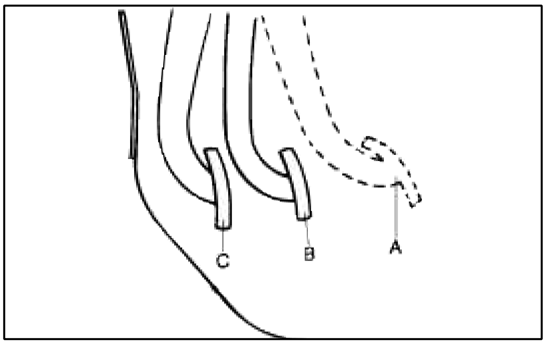
Use the specified fluid. Avoid mixing different brands of fluid. Specified fluid : SAE J1703 (DOT 3 or DOT 4).



1. Loosen the bleeder screw at the clutch release cylinder.
2. Push the clutch pedal down slowly until all air is expelled.
3. Hold the clutch pedal down until the bleeder is retightened.
4. Refill the clutch master cylinder with the specified fluid.

CAUTION

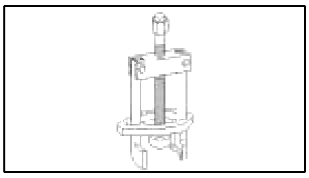
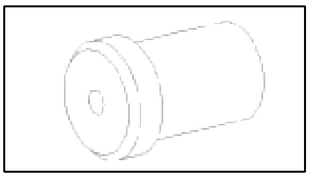
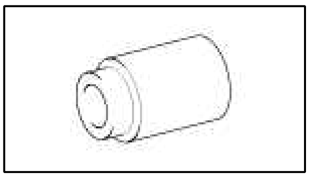
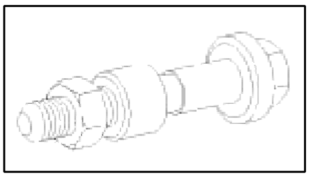
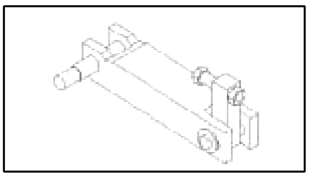
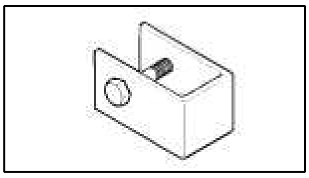
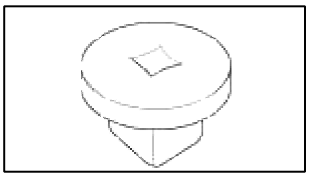
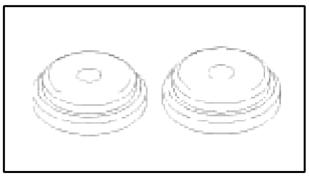
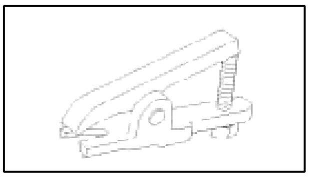
The rapidly-repeated operation of the clutch pedal in B-C range may cause the release cylinder's position to be forced out from the release cylinder body during air bleeding. Repress the clutch pedal after it returns to the "A" point completely.



ACCENT(LC) > 2005 > G 1.5 SOHC > Driveshaft and axle

Driveshaft and axle > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and Name)	Illustration	Use
09495-33000 Puller		Removal of wheel bearing inner race from hub.
09495-33100 Center bearing remover and installer		• Removal of wheel bearing from knuckle. (use with 09517-29000) • Installation of hub to knuckle.
09517-21200 Front axle base		• Installation of the rear axle shaft bearing retainer. • Installation of tone wheel and dust cover to a Birfield joint.
09517-21500 Front hub remover and installer		• Removal of front hub from knuckle. (use with 09517-29000) • Measurement of front wheel bearing pre-load. (use with 09532-11600)
09517-29000 Knuckle arm birdge		• Removal of front hub from knuckle. (use with 09517-21500) • Removal of wheel bearing outer race from knuckle. (use with 09495-33100)
09517-3A000 Knuckle arm bridge holder		Removal of knuckle arm bridge. (use with 09517-21500, 09517-29000)
09532-11600 Preload socket		Measurement of front wheel bearing pre-load. (use with 09517-21500)
09532-31200A Oil seal installer		Installation of wheel bearing to knuckle.
09568-34000 Ball joint puller		Seperation of front lower arm and tie rod end ball joint.

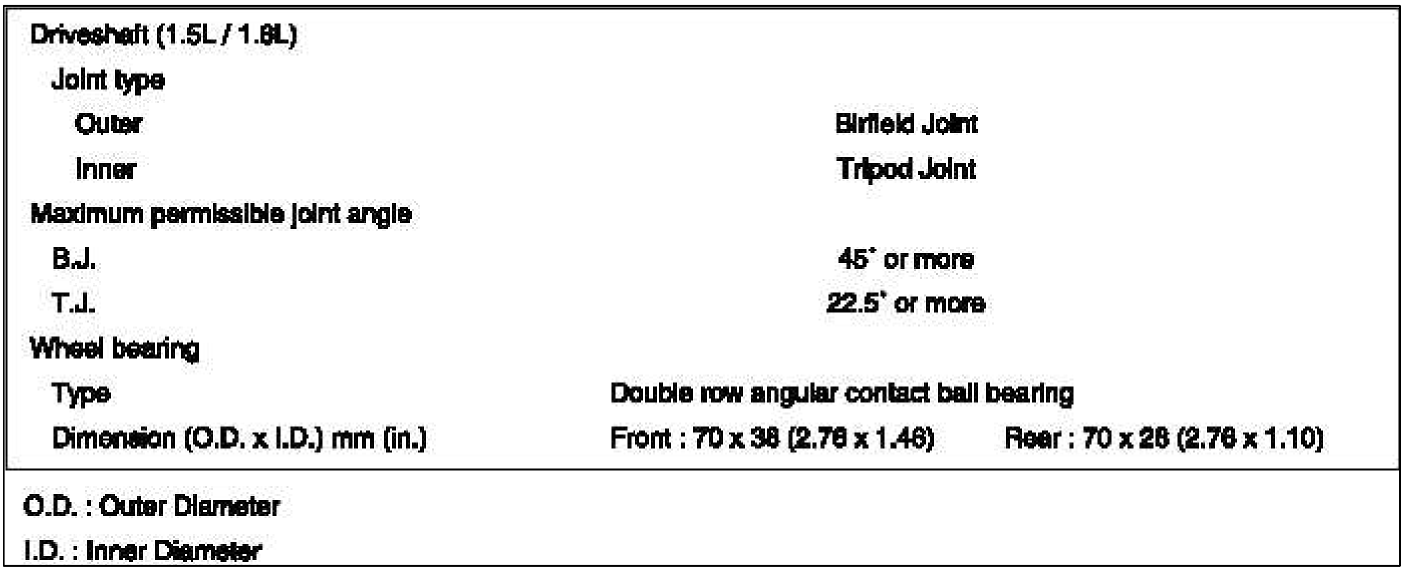
Driveshaft and axle > General Information > Troubleshooting

TROUBLESHOOTING

Symptom	Possible cause	Remedy
Vehicle pulls to one side	Galling of driveshaft ball joint	Replace
	Wear, rattle or galling of wheel bearing	Replace
	Defective front suspension and steering	Adjust or replace
Vibration	Wear, damage or bending of driveshaft	Replace
	Driveshaft rattle and hub serration	Replace
	Wear, rattle or scratching of wheel bearing	Replace
Shimmy	Improper wheel balance	Adjust or replace
	Defective front suspension and steering	Adjust or replace
Excessive noise	Wear, damage or bending of driveshaft	Replace
	Driveshaft rattle and hub serration	Replace
	Driveshaft rattle and side gear serration	Replace
	Wear, rattle or galling of wheel bearing	Replace
	Loose hub nut	Adjust or replace
	Defective front suspension and steering	Adjust or replace

Driveshaft and axle > General Information > Specifications

SPECIFICATIONS



Driveshaft (1.5L / 1.6L)		
Joint type		
Outer	Birfield Joint	
Inner	Tripod Joint	
Maximum permissible joint angle		
B.J.	45° or more	
T.J.	22.5° or more	
Wheel bearing		
Type	Double row angular contact ball bearing	
Dimension (O.D. x I.D.) mm (in.)	Front : 70 x 38 (2.76 x 1.46)	Rear : 70 x 28 (2.76 x 1.10)

O.D. : Outer Diameter

I.D. : Inner Diameter

TIGHTENING TORQUE

Item	Nm	Kgf·cm	lbf·ft
Castle nut	220 ~ 260	2200 ~ 2600	159 ~ 188
Knuckle to strut assembly nut	75 ~ 90	750 ~ 900	54 ~ 65
Lower arm ball joint to knuckle nut	60 ~ 72	600 ~ 720	43 ~ 52
Wheel nut	90 ~ 110	900 ~ 1100	66 ~ 81
Rear hub bearing flange nut	180 ~ 220	1800 ~ 2200	133 ~ 162
Rear strut to carrier nut	75 ~ 90	750 ~ 900	55 ~ 66
Trailing arm to carrier nut	130 ~ 150	1300 ~ 1500	96 ~ 110
Rear suspension arm to carrier nut	130 ~ 150	1300 ~ 1500	96 ~ 110
Stabilizer bracket nut	17 ~ 26	170 ~ 260	12 ~ 19
Stabilizer assembled nut	35 ~ 45	350 ~ 450	25 ~ 33
Rear suspension arm flange nut	100 ~ 120	1000 ~ 1200	72 ~ 87
Rear suspension arm cam bolt	80 ~ 100	800 ~ 1000	58 ~ 72
Front hub to brake disk screw	10 ~ 20	100 ~ 200	7 ~ 14

CAUTION

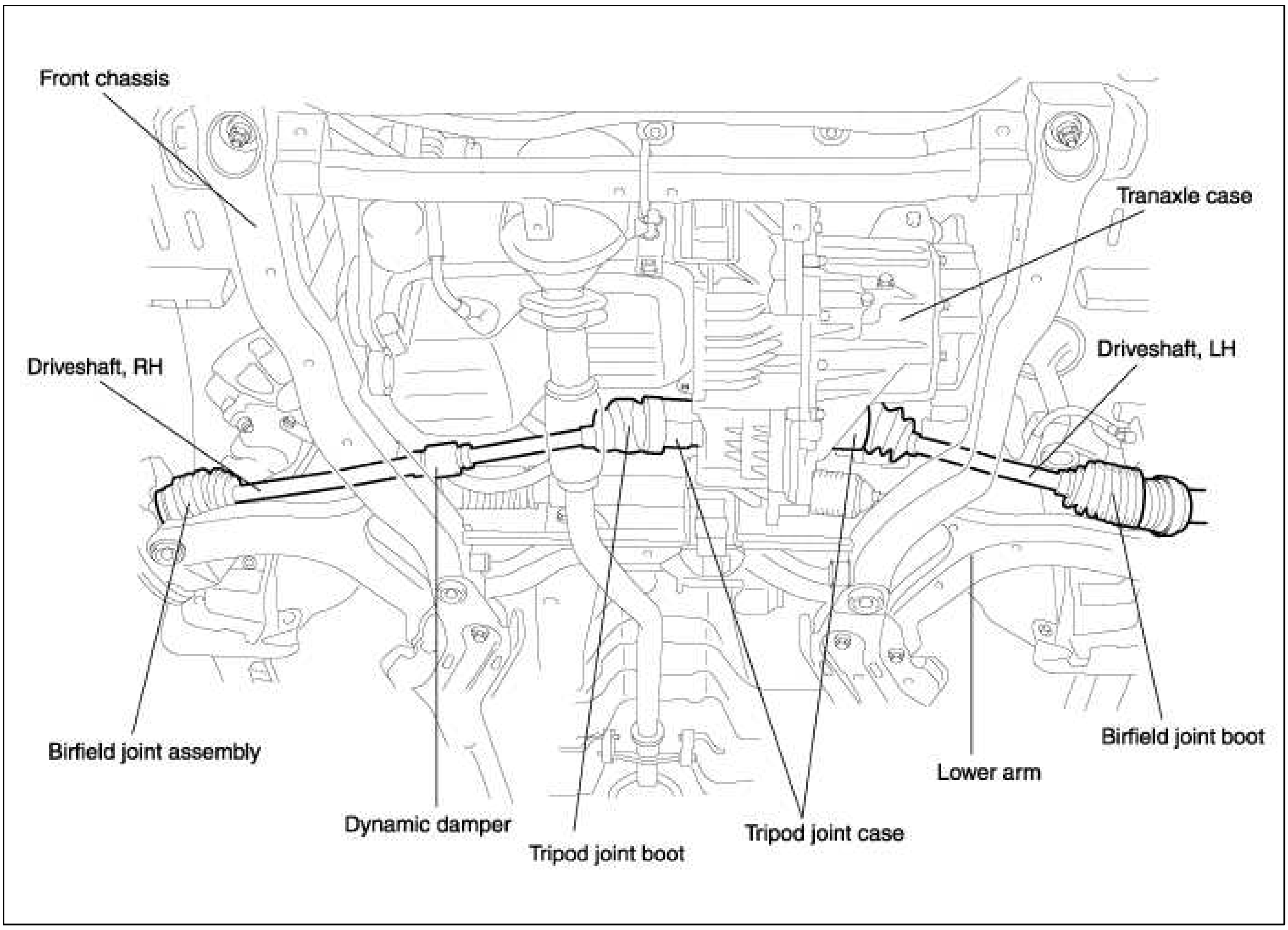
Replace the self-locking nuts with new ones after removal.

LUBRICANTS

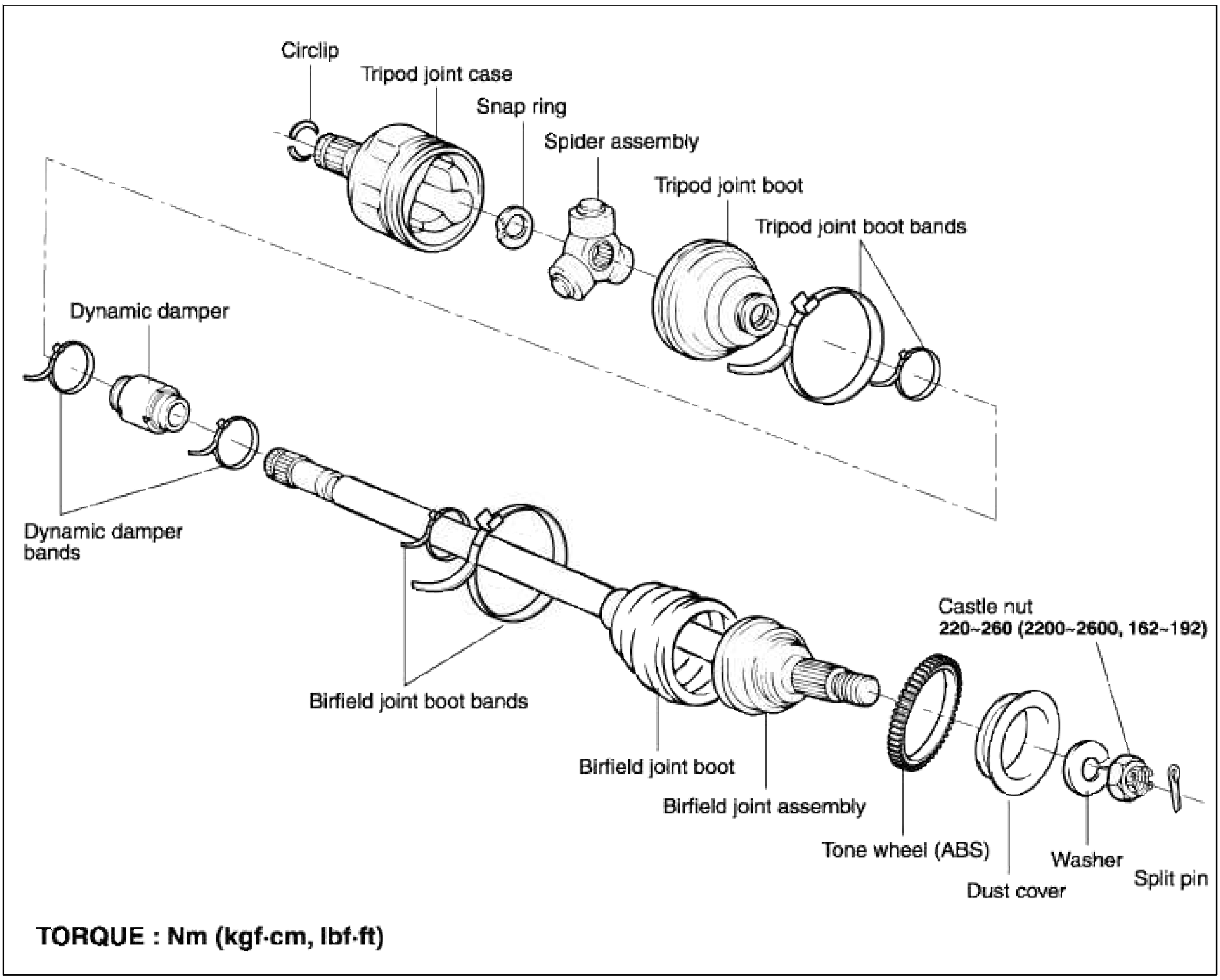
Tripod joint - Birfield joint type driveshaft (For 1.5L/1.6L)	Recommended lubricant	Quantity
Birfield joint boot grease	Centoplex 278M/136K CASMOLY BJ ROLLUBE BJ Sunlight SW-2	85 ± 6 gr. - Joint : 40 ± 3 gr. - Boot : 45 ± 3 gr.
Tripod joint boot grease	KLK TJ 41-182 CASMOLY TJ ROLLUBE TJ Oneluber MK	95 ± 6 gr. - Joint : 60 ± 3 gr. - Boot : 35 ± 3 gr.

Driveshaft and axle > Driveshaft Assembly > Front Driveshaft > Components and Components Location

COMPONENTS


Front chassis
Tranaxle case
Driveshaft, RH
Driveshaft, LH
Birfield joint assembly
Dynamic damper
Tripod joint boot
Tripod joint case
Lower arm
Birfield joint boot

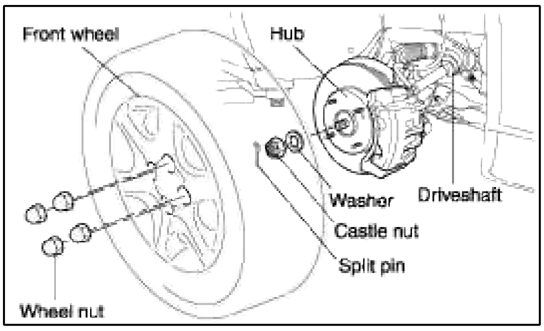
COMPONENTS


Circlip
Tripod joint case
Snap ring
Spider assembly
Tripod joint boot
Tripod joint boot bands
Dynamic damper
Dynamic damper bands
Birfield joint boot bands
Castle nut
220~260 (2200~2600, 162~192)
Birfield joint boot
Birfield joint assembly
Tone wheel (ABS)
Washer
Split pin
Dust cover
TORQUE : Nm (kgf·cm, lbf·ft)

Driveshaft and axle > Driveshaft Assembly > Front Driveshaft > Repair procedures

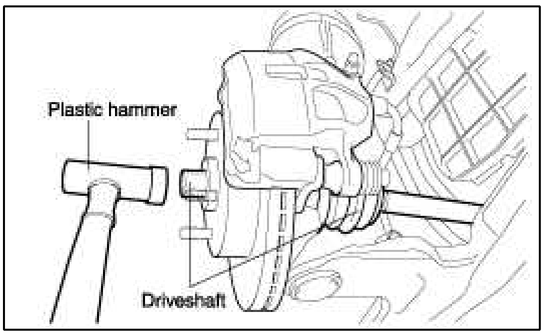
REMOVAL

1. Loosen the wheel nuts slightly.
2. Raise the front of the vehicle, and support it with safety stands in a proper location.
3. Remove the wheel nuts and front wheel.

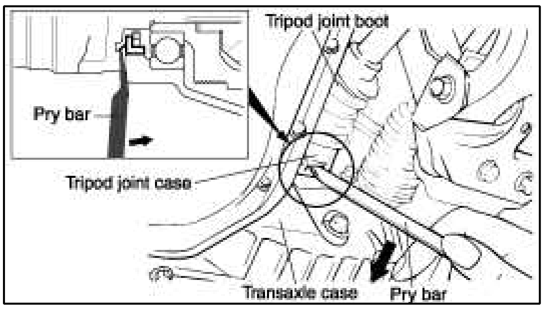

Front wheel
Hub
Washer
Driveshaft
Castle nut
Split pin
Wheel nut

4. Remove the split pin, the castle nut and the washer from the front hub.
5. Drain the transmission fluid before the driveshaft is removed.

6. Using a plastic hammer, make the driveshaft disconnected from the axle hub.


Plastic hammer
Driveshaft

7. Push the axle hub outward and separate the driveshaft from the axle hub.
8. Insert a pry bar between the transaxle case and the tripod joint case, and pry the driveshaft from the transaxle case.


Tripod joint boot
Pry bar
Tripod joint case
Transaxle case
Pry bar

CAUTION

- Be sure to apply the pry bar to the rib of the transaxle case.
- Do not insert the pry bar too deeply, as this may cause damage to the oil seal. [max. depth : 7 mm (0.28 in.)]
- For automatic transaxle equipped vehicles, insert a pry bar into the groove of the driveshaft to remove the driveshaft from the transaxle.
- Do not pull on the driveshaft; the joints may come apart. Be sure to use the pry bar.

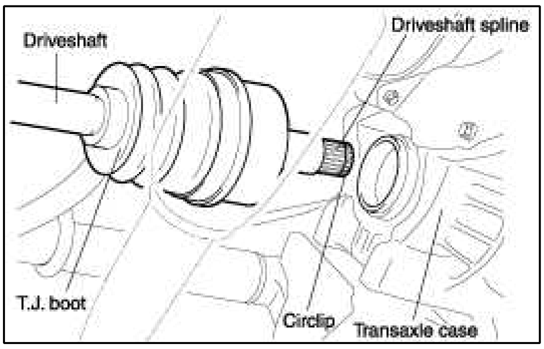
9. Pull out the driveshaft from the transaxle case.

CAUTION

- Place a plug in the hole of the transaxle case to prevent contamination
- Support the driveshaft properly.
- Replace the circlip each time the driveshaft is removed from the transaxle case.

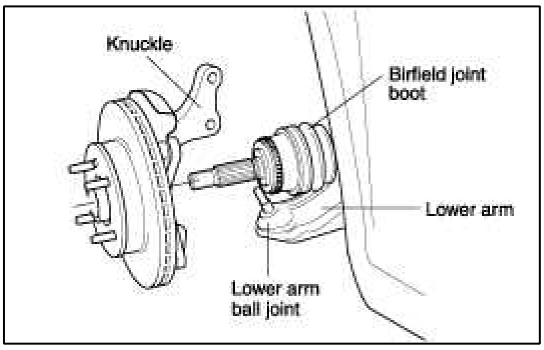
INSTALLATION

1. Coat gear oil on the driveshaft splines and transaxle case-sliding surface.

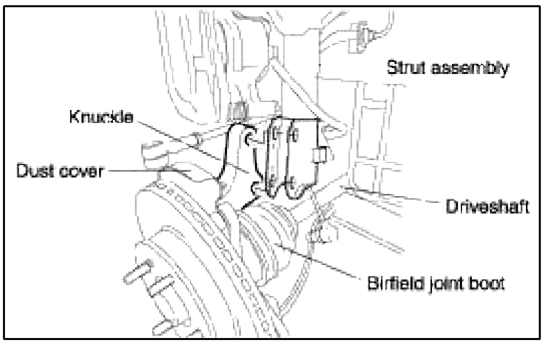

Driveshaft
Driveshaft spline
T.J. boot
Circlip
Transaxle case

2. Before installing the driveshaft, set the opening side of the circlip facing downward.
3. Assemble the dust cover, the hub, the brake disc and the wheel bearing to the knuckle.

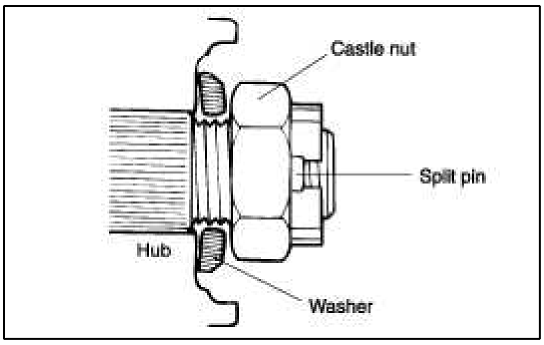
4. Install the birfield joint into the knuckle.


Knuckle
Birfield joint boot
Lower arm
Lower arm ball joint

5. In practice, the knuckle should be installed in the lower arm the moment the birfield joint is installed in the knuckle. Be careful not to damage the boot.
6. Install the knuckle in the strut assembly with the tightening torque, 75~90 Nm (750~900 kgf·cm, 54~65 lbf·ft).


Strut assembly
Knuckle
Dust cover
Driveshaft
Birfield joint boot

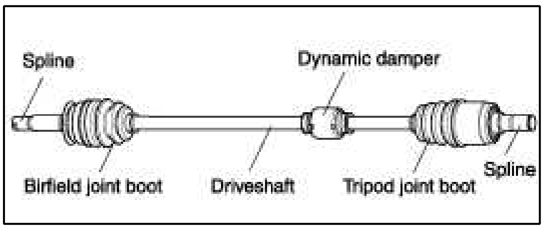
7. Install the lower arm in the knuckle with the tightening torque 60~72 Nm (600~720 kgf·cm, 43~52 lbf·ft).
8. After the installation, check on the driveshaft for manuever by hand.
9. After installing the washer with convex surface outward, install the castle nut and the split pin.


Castle nut
Split pin
Hub
Washer

10. Install the wheel and tire.

INSPECTION

1. Check the boots on the driveshaft for cracks, damage, leaking grease and loose boot bands. If any damage is found, replace the boot and boot bands.
2. Check the joints for wear and operating condition.
3. Turn the driveshaft by hand and make sure the splines and the joints are not excessively loose. If damage is found, replace the joint.


Spline
Dynamic damper
Birfield joint boot
Driveshaft
Tripod joint boot
Spline

4. Check the splines for wear and damage.
5. Make sure the driveshaft is not twisted or cracked. Replace it if necessary.

DISASSEMBLY

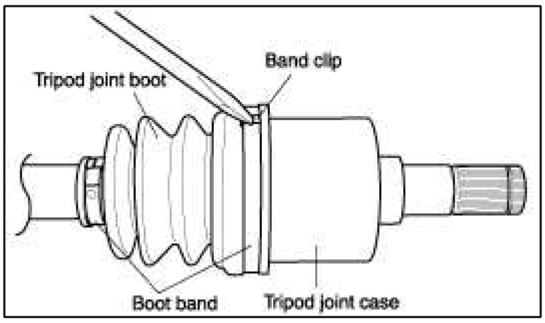
NOTE

- Do not disassemble the birfield joint assembly.
- The driveshaft joint uses special grease. Do not substitute with another type of grease. (see page DS-3)
- The boot band should be replaced with a new one.

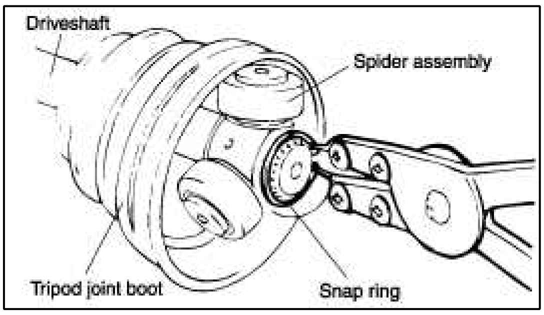
1. Loosen the tripod joint boot bands and pull the tripod joint boot from the tripod joint case.

NOTE

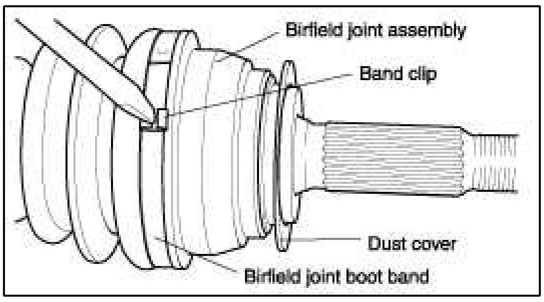
Be careful not to damage the boot.


Tripod joint boot
Band clip
Boot band
Tripod joint case

2. Seperate the tripod joint boot from the tripod joint case.
3. Remove the snap ring and spider assembly from the driveshaft.

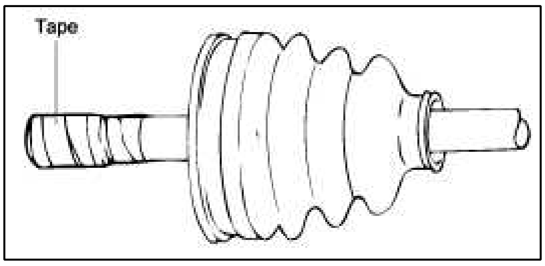

Driveshaft
Spider assembly
Tripod joint boot
Snap ring

4. Clean the spider assembly.
5. Remove the birfield joint boot bands and pull out the birfield joint boot.

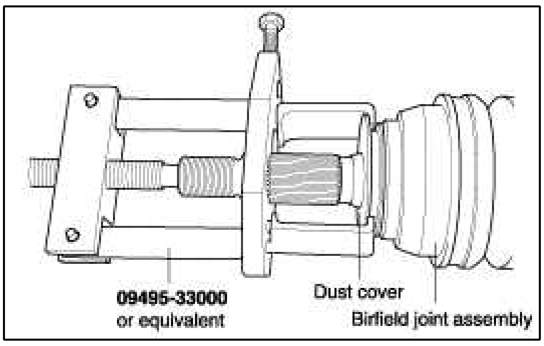

Birfield joint assembly
Band clip
Dust cover
Birfield joint boot band

NOTE

If the boot is to be reused, wrap tape around the driveshaft splines to protect the boot.

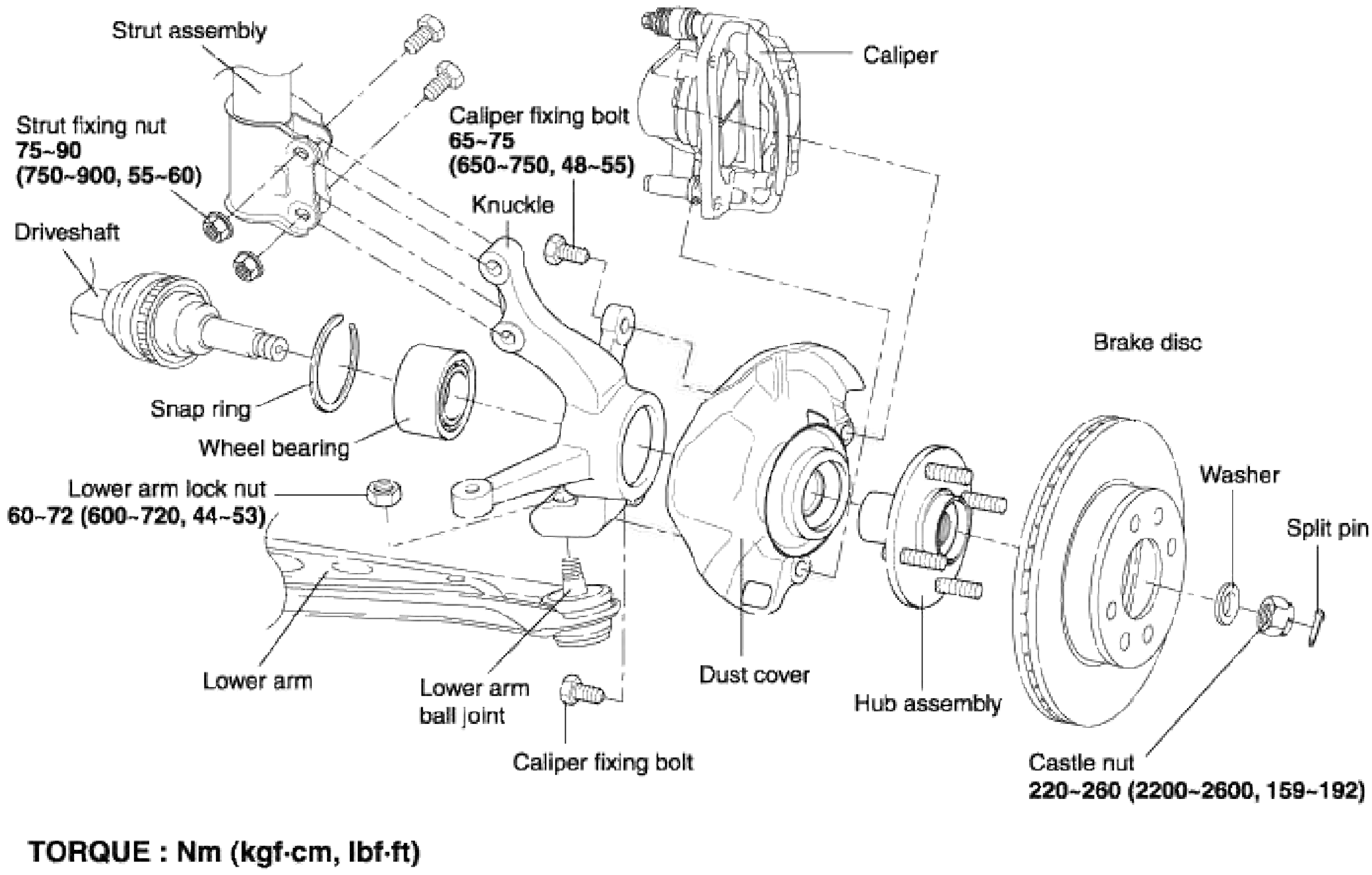


6. Remove the dust cover from the birfield joint assembly using the special tool(09495-33000) or a proper one.


09495-33000
or equivalent
Dust cover
Birfield joint assembly

Driveshaft and axle > Front Axle Assembly > Front Hub / Axle > Components and Components Location

COMPONENTS


Strut assembly
Strut fixing nut
75~90
(750~900, 55~60)
Driveshaft
Caliper fixing bolt
65~75
(650~750, 48~55)
Knuckle
Caliper
Brake disc
Snap ring
Wheel bearing
Lower arm lock nut
60~72 (600~720, 44~53)
Washer
Split pin
Lower arm
Lower arm
ball joint
Dust cover
Hub assembly
Caliper fixing bolt
Castle nut
220~260 (2200~2600, 159~192)
TORQUE : Nm (kgf·cm, lbf·ft)

Driveshaft and axle > Front Axle Assembly > Front Hub / Axle > Repair procedures

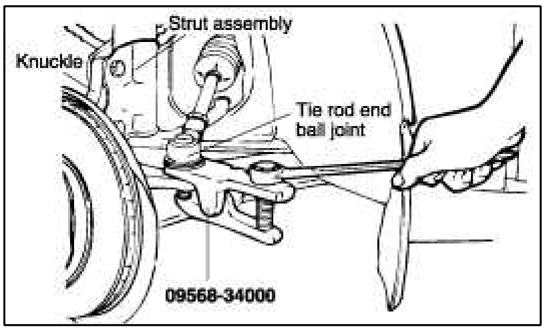
REMOVAL

1. Raise the vehicle and remove the front wheel.
2. Remove the castle nut.
3. Remove the front caliper assembly from the knuckle and suspend it with a wire.
4. Remove the wheel speed sensor from the knuckle.

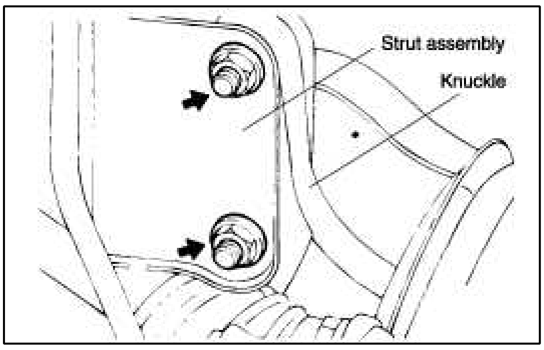
5. Disconnect the tie rod end ball joint from the knuckle using the special tool (09568-34000).

NOTE

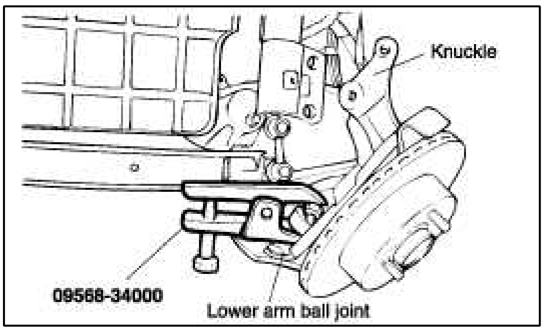
- Be sure to tie the cord of the special tool (09568-34000) to the nearby part.
- Loosen the nut, but do not remove it.


Strut assembly
Knuckle
Tie rod end ball joint
09568-34000

6. Disconnect the strut assembly from the knuckle.


Strut assembly
Knuckle

7. Disconnect the driveshaft from the hub.
8. Disconnect the lower arm ball joint from the knuckle using the special tool (09568-34000).


Knuckle
09568-34000
Lower arm ball joint

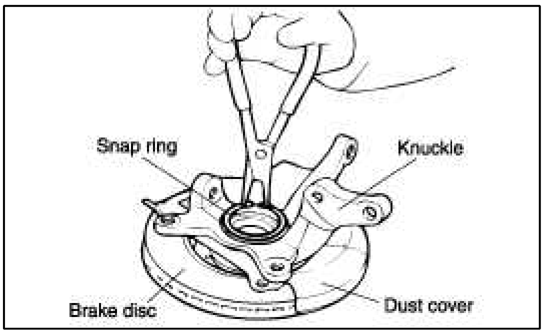
9. Remove the hub and knuckle as an assembly.

INSTALLATION

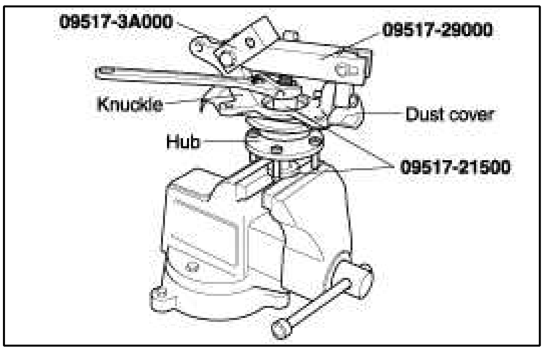
Installation is in the reverse order of removal (see page DS-13).

DISASSEMBLY

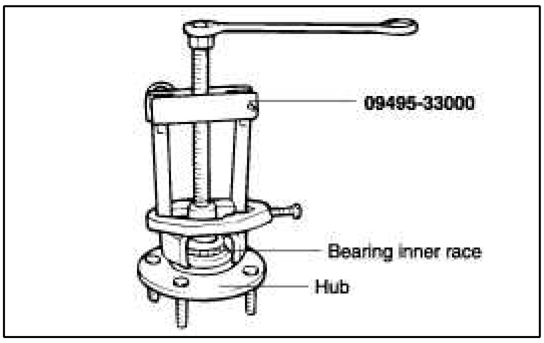
1. Remove the brake disc from the hub.
2. Remove the snap ring.


Snap ring
Knuckle
Brake disc
Dust cover

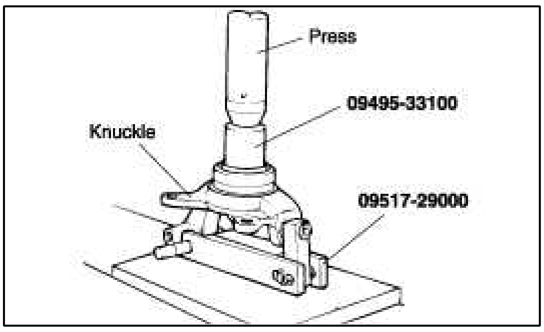
3. Install the special tools (09517-21500, 09517-29000, 09517-3A000) as illustrated.


09517-3A000
09517-29000
Knuckle
Dust cover
Hub
09517-21500

4. Remove the hub from the knuckle by turning the nut of the special tool (09517-21500).
5. Remove the special tools (09517-21500, 09517-29000, 09517-3A000) and the dust cover.
6. Remove the bearing inner race from the hub using the special tool (09495-33000).


09495-33000
Bearing inner race
Hub

7. Using the special tools (09495-33100, 09517-29000), remove the wheel bearing outer race from the knuckle.


Press
09495-33100
Knuckle
09517-29000

INSPECTION

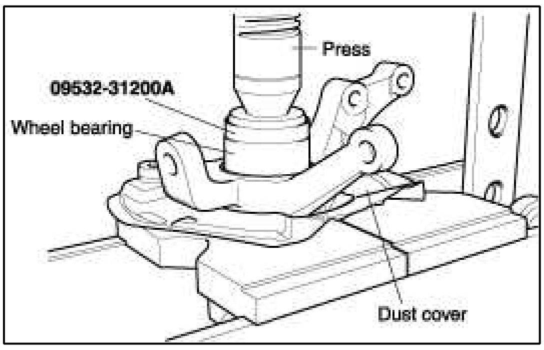
1. Check the hub for cracks and the splines for wear.
2. Check the brake disc for scoring and damage.
3. Check the knuckle for cracks.
4. Check the snap ring for crack or damage.

REASSEMBLY

1. Apply a thin coat of multi-purpose grease to the knuckle and bearing contact surface.
2. Using the special tool (09532-31200A), press the bearing into the knuckle.

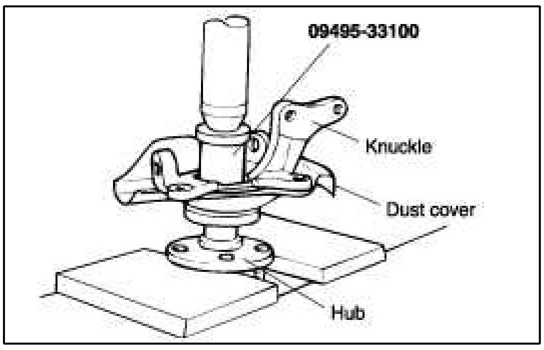
> **NOTE**
>
> - Do not press on the inner race of the wheel bearing. That will cause damage to the bearing assembly.
> - When installing a bearing assembly, always use a new one.
> - Left and right bearing must be from one manufacturer.

3. Install the dust cover.

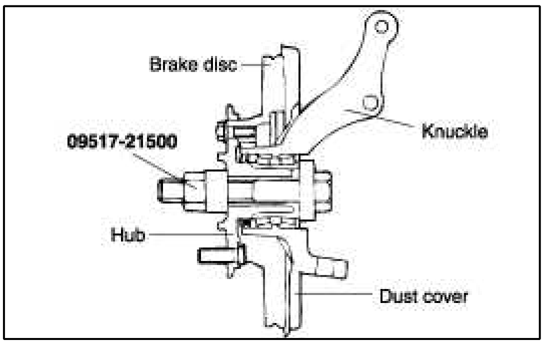

Press
09532-31200A
Wheel bearing
Dust cover

4. Using the special tool(09495-33100), press the hub into the knuckle.

> NOTE
>
> Do not press on the outer race of the wheel bearing. That will cause damage to the bearing assembly.


09495-33100
Knuckle
Dust cover
Hub

5. Install the brake disc.
6. Tighten the hub to the knuckle to 220~260 Nm (2200~2600 kgf·cm, 159~188 lbf·ft) with the special tool (09517-21500).

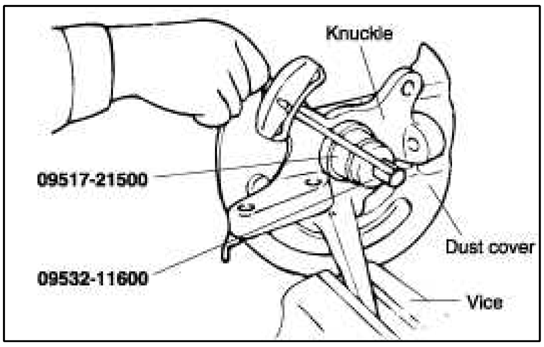

Brake disc
09517-21500
Knuckle
Hub
Dust cover

7. Rotate the hub several times to seat bearing.
8. Measure the hub bearing starting torque.

Hub bearing starting torque [Limit]
1.3 Nm (13 kgf·cm, 0.96 lbf·ft) or less

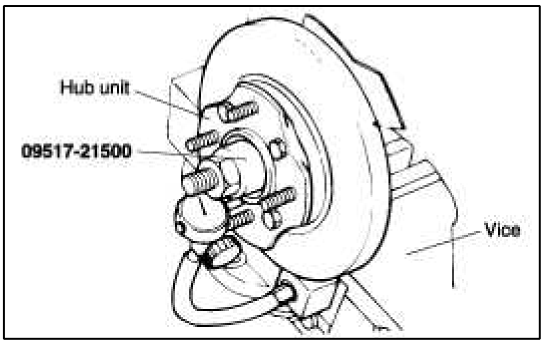
---

9. If the measuring load is 0kg, measure the hub bearing axial end play.


Knuckle
09517-21500
09532-11600
Dust cover
Vice

10. If the hub bearing axial end play exceeds the limit while the nut is tightened to 220~260 Nm (2200~2600 kgf·cm, 159~188 lbf·ft), the bearing, hub and knuckle have not been installed correctly. Repeat the disassembly and assembly procedure.

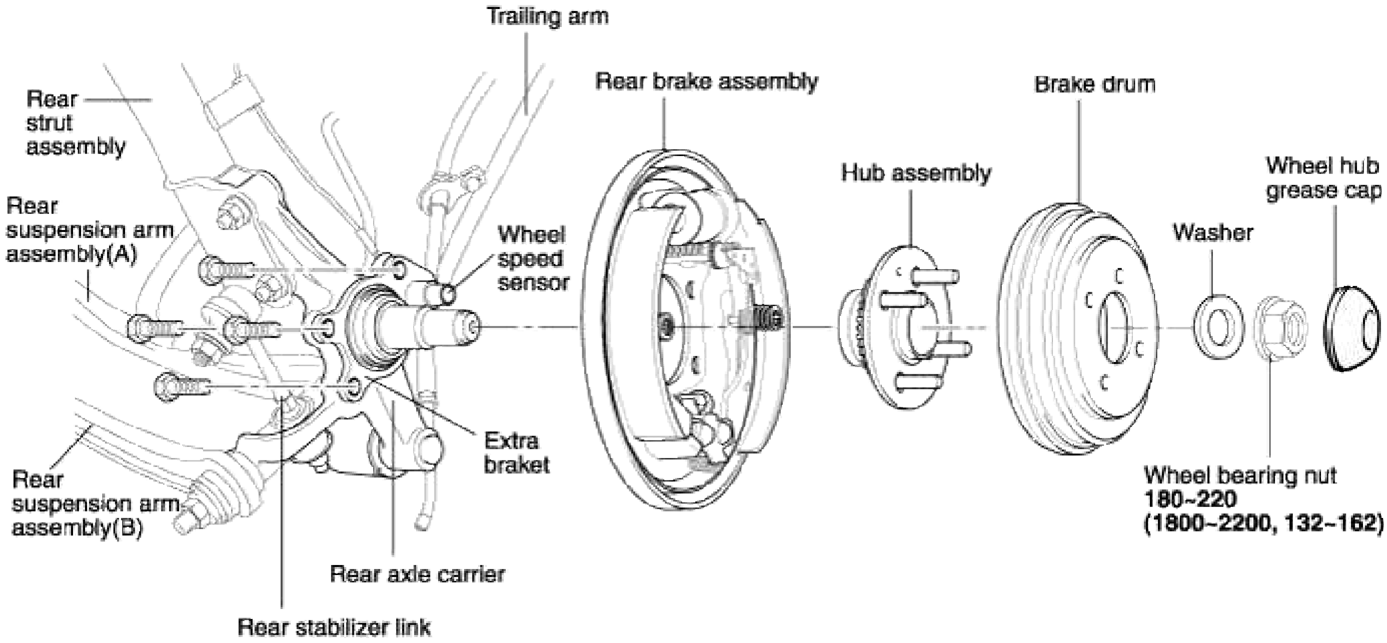
Hub bearing axial end play [Limit]
0.051 ~ 0.075 mm (0.0020 ~ 0.0029 in.) or less


Hub unit
09517-21500
Vice

11. Remove the special tool. (09517-21500)

Driveshaft and axle > Rear Axle Assembly > Rear Hub / Carrier > Components and Components Location

COMPONENTS

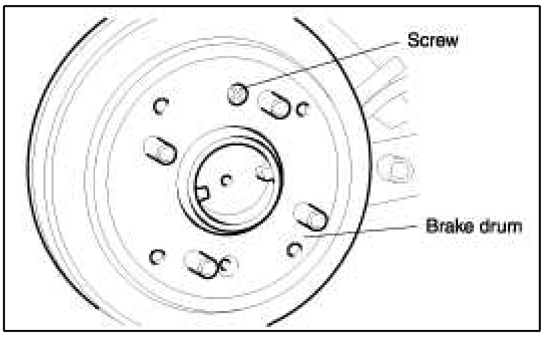

Trailing arm
Rear brake assembly
Brake drum
Rear strut assembly
Hub assembly
Wheel hub grease cap
Rear suspension arm assembly(A)
Washer
Wheel speed sensor
Extra braket
Rear suspension arm assembly(B)
Wheel bearing nut
180~220
(1800~2200, 132~162)
Rear axle carrier
Rear stabilizer link

TORQUE : Nm (kgf·cm, lbf·ft)

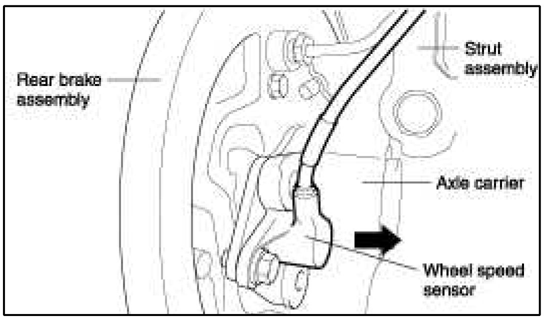
Driveshaft and axle > Rear Axle Assembly > Rear Hub / Carrier > Repair procedures

REMOVAL

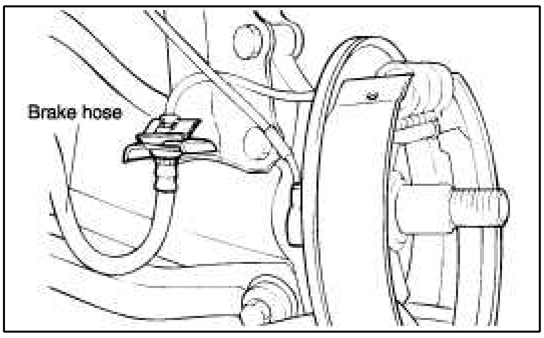
1. Remove the wheel hub grease cap.
2. Remove the wheel bearing nut and the tongued washer.
3. Remove the screw from the brake drum.


Screw
Brake drum

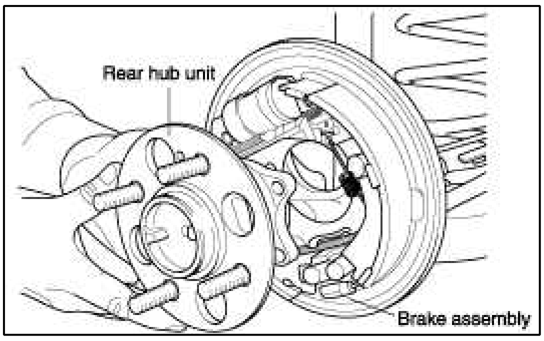
4. Remove the brake drum.
5. Remove the wheel speed sensor from the axle carrier.


Rear brake assembly
Strut assembly
Axle carrier
Wheel speed sensor

6. Remove the brake hose clip and detach the brake hose from the shock absorber.



7. Remove the rear hub unit bearing from the brake assembly.


Rear hub unit
Brake assembly

INSTALLATION

Installation is in the reverse order of removal.

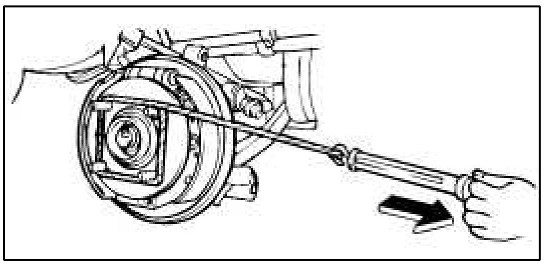
1. Install the rear hub unit bearing.
2. Assemble the tongued washer and the wheel bearing nut.

> **NOTE**
>
> Left and right bearing must be from one manufacturer. Press inner race until it contacts the end of the splines.

3. Hammer the wheel bearing nut for the groove in the carrier.
4. Connect the rear speed sensor.
5. Fix up the brake drum to the rear hub assembly with the screw.
6. Install the wheel hub grease cab.

INSPECTION

1. Check the rear hub bearing for wear or damage.
2. Check the rear tone wheel for chipped teeth.
3. Check the rotating rear hub unit bearing for noise.
4. Check the hub inner surface for wear.
5. Check the carrier for cracks.
6. Check the rear hub unit bearing starting torque (it should be less than 1.8 Nm (18 kgf·cm, 1.33 lbf·ft)).

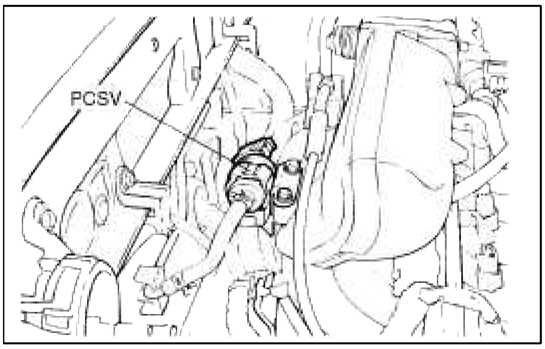


ACCENT(LC) > 2005 > G 1.5 SOHC > Emission Control System

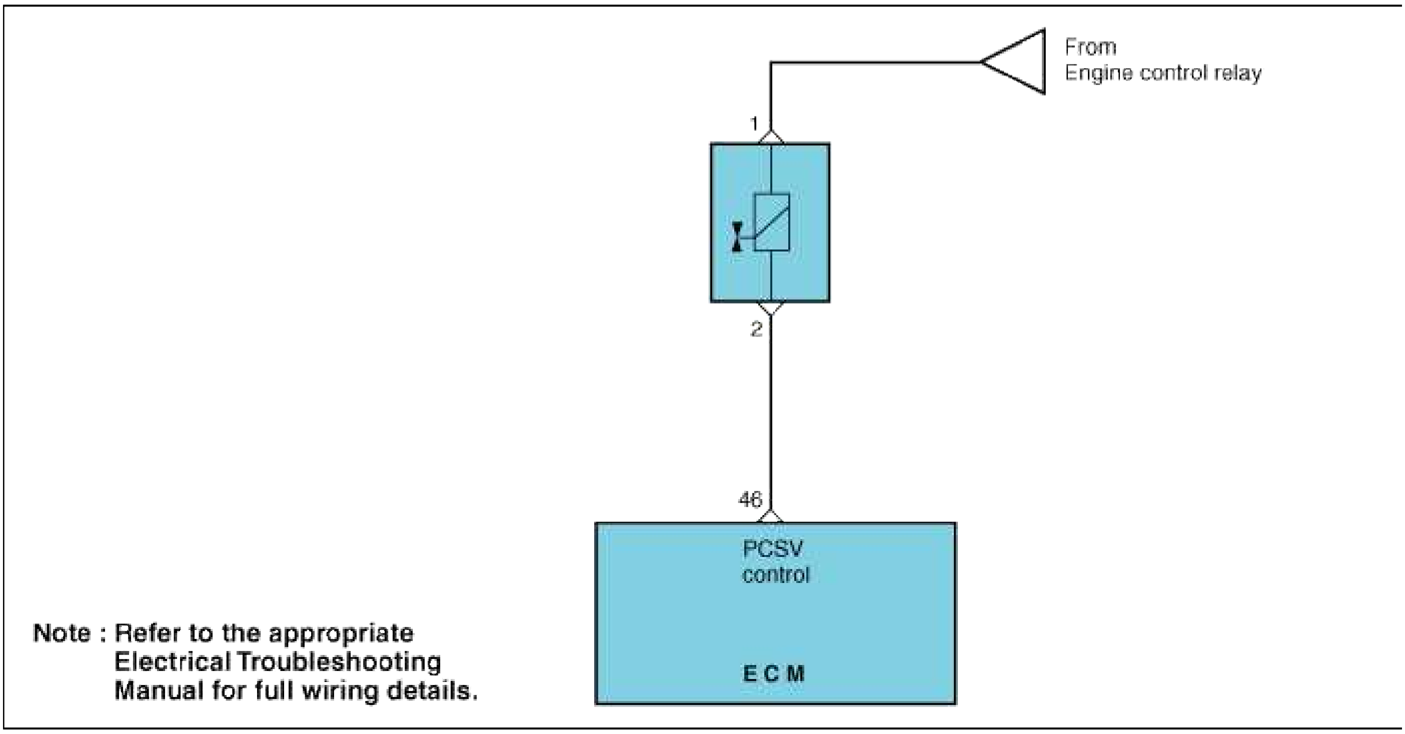
Emission Control System > Evaporative Emission Control System > Purge Control Solenoid Valve (PCSV) > Troubleshooting

PURGE SOLENOID VALVE

The evaporative emission canister purge solenoid valve is a duty control type, which controls the flow of purge air from the evaporative emission canister.



CIRCUIT DIAGRAM

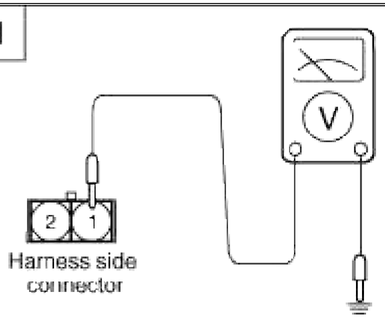
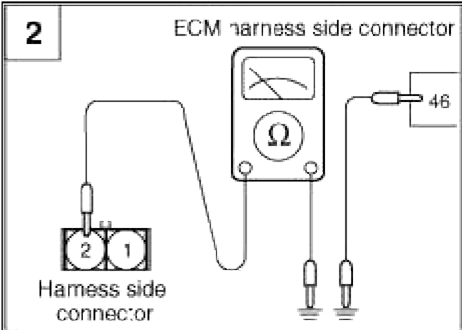


Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

USING HI-SCAN

Check item	Check condition	HI-SCAN display	Type
Evaporative emission canister purge solenoid valve • Actuator test	Start the engine	Purge valve	Activate

HARNESS INSPECTION PROCEDURES

1 	Measure the power supply voltage. • Connector : Disconnected • Ignition switch : ON • Voltage : Battery voltage	**OK** ⇨ **NG** ⇨	**2** Repair the harness.
2  ECM harness side connector 46 Ω 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the evaporative emission canister purge solenoid valve and the engine control module. • Engine control module connector : Disconnected • Evaporative emission canister purge solenoid valve connector : Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

ACTUATOR INSPECTION

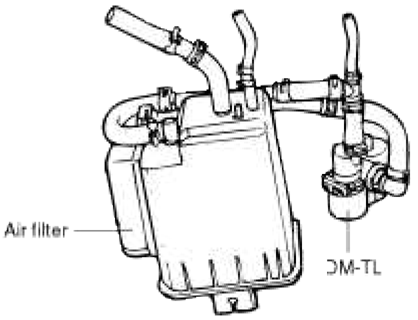
Refer to GROUP EC-Evaporative Emission System.

Emission Control System > Evaporative Emission Control System > Diagnosis Module - Tank Leakage (DMTL) > Troubleshooting

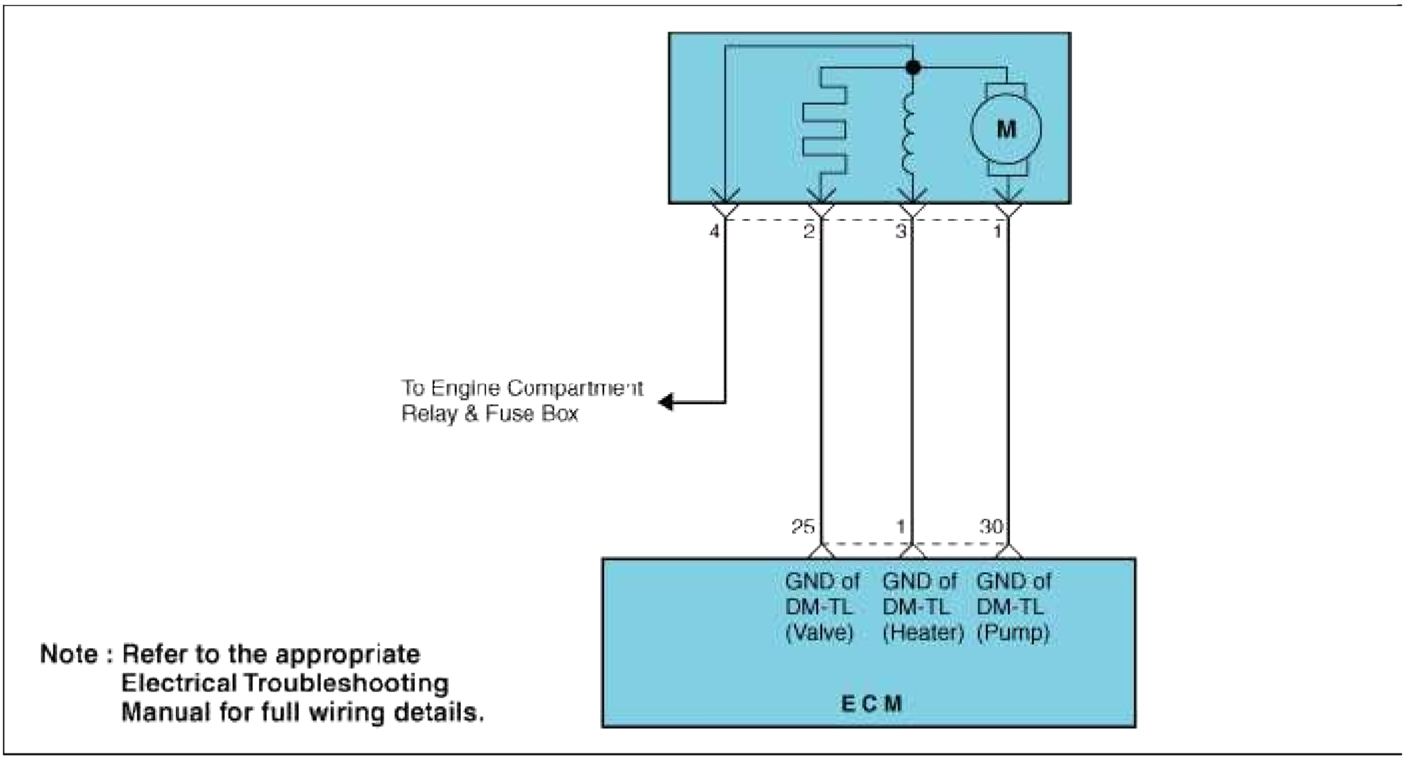
DIAGNOSIS MODULE - TANK LEAKAGE (DM-TL)

The diagnosis module comprises an electromechanically driven pump together with a change-over valve and heater. The engine management system measures the pump's electrical current consumption while pumping air into the canister and fuel tank to check the system's leakage.

If the electrical current consumption is over the threshold value specified before in the memory, this means that there is a tank-system leak.

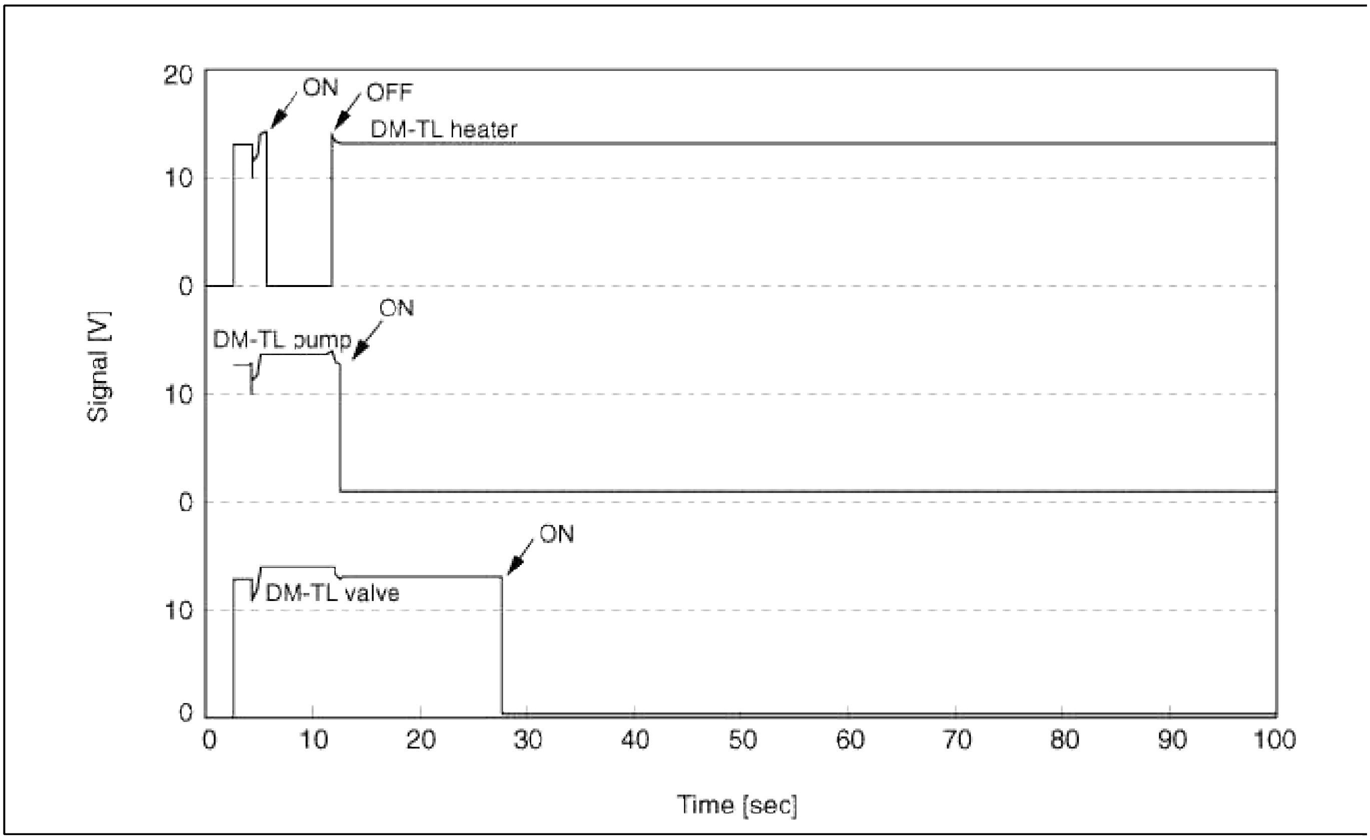


CIRCUIT DIAGRAM


M
4
2
3
1
To Engine Compartment Relay & Fuse Box
25
1
30
GND of DM-TL (Valve)
GND of DM-TL (Heater)
GND of DM-TL (Pump)
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

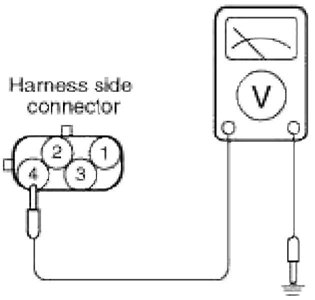
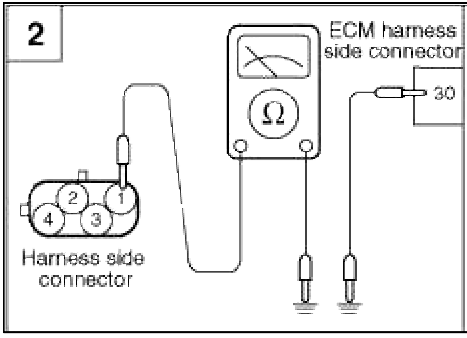
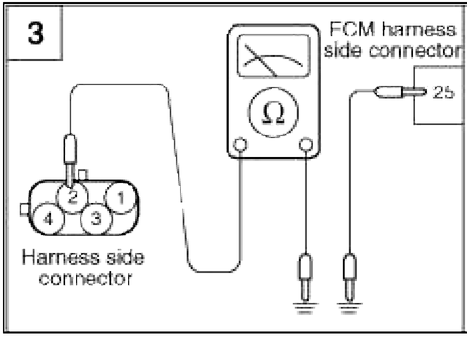
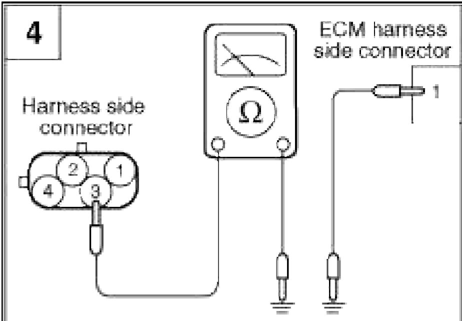
TROUBLESHOOTING HINTS

1. DM-TL control signal



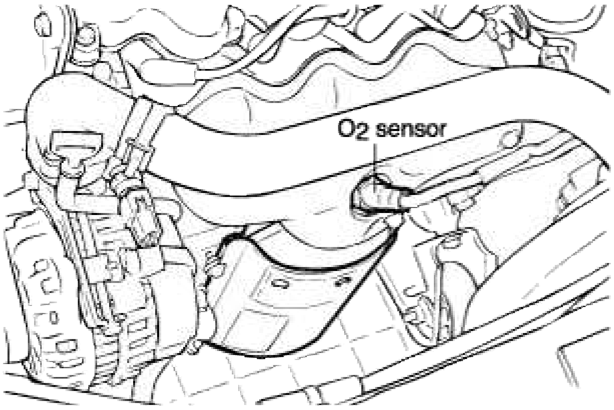
2. DM-TL operating conditions.
   (1) DM-TL monitoring operation starts only after all the conditions below are met.
      A. Vehicle soaking over 4 hours and 30 minutes.
      B. Engine coolant temperature over 2.3°C (36.14°F) when starting.
      C. Ambient temperature between 1.5°C (34.7°F) and 40.5°C (104.9°F).
      D. 6.4ℓ or more gasoline in the fuel tank.
      E. Over 20 minutes driving after starting.
      F. During Air Bag is not working.
   (2) And also you can check the DM-TL operation with simulation mode of HI-SCAN.

HARNESS INSPECTION PROCEDURES

1  Harness side connector V 1 2 3 4	Measure the power supply voltage of the DM-TL. • Connector : Disconnected • Ignition switch : ON • Voltage (V) : Battery voltage	**OK** ⇒ **NG** ⇒	2 Repair the harness.
2  ECM harness side connector 30 Ω 1 2 3 4 Harness side connector	Check for an open-circuit, or short-circuit to ground between the ECM and DM-TL. • DM-TL connector : Disconnected • ECM connector : Disconnected	**OK** ⇒ **NG** ⇒	3 Repair the harness.
3  ECM harness side connector 25 Ω 1 2 3 4 Harness side connector	Check for an open-circuit, or short-circuit to ground between the ECM and DM-TL. • DM-TL connector : Disconnected • ECM connector : Disconnected	**OK** ⇒ **NG** ⇒	4 Repair the harness.
4  ECM harness side connector 1 Ω Harness side connector 1 2 3 4	Check for an open-circuit, or short-circuit to ground between the ECM and DM-TL. • DM-TL connector : Disconnected • ECM connector : Disconnected	**OK** ⇒ **NG** ⇒	END! Repair the harness.

Emission Control System > Troubleshooting > P0420

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Oxygen storage capacity	● Warm-up catalytic converter deteriorated. ● Leak in intake system. ● Faulty HO2S. ● Faulty PCM.
Threshold value	● Difference of 'amplitude of downstream O2 sensor and 'amplitude of model signal' : > 0.55	
Enable Conditions	● Engine speed 1200-2520 rpm ● Engine load 20-25% ● Catalyst temp.(model) 530-760 degC(986~1400 °F) ● Purge factor (high load canister) < 10 ● Closed loop control	
Diagnostic Time	● 100 sec	
Fail Safe	● None	

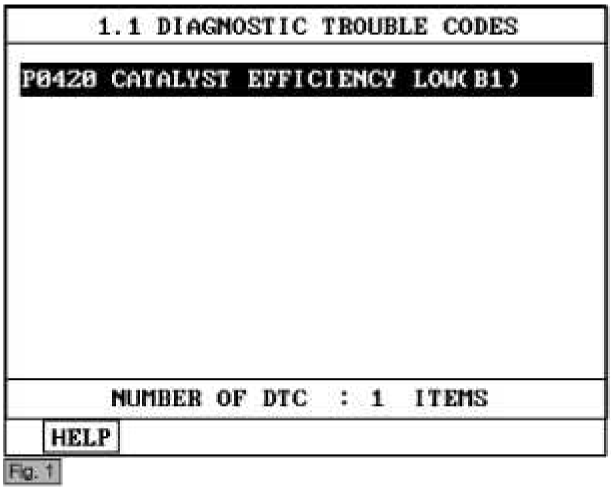
NOTE

If any codes relating to Oxygen(HO2S) sensor.MAP, injector, a P0171,P0172 are present, do all repairs associated with them before proceeding with this troubleshooting procedure.

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "HO2S signal" parameter on the scantool.

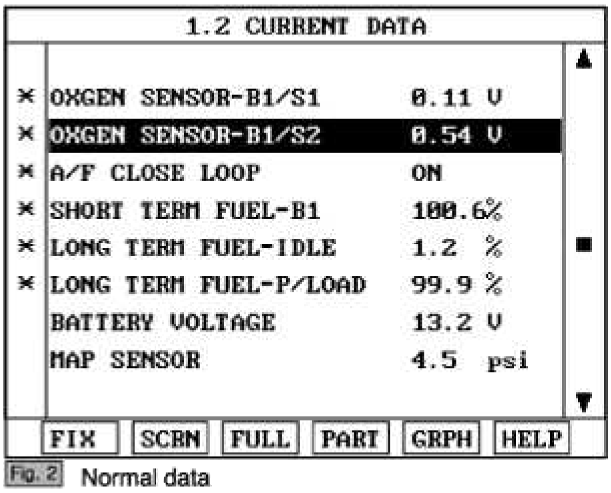


1.1 DIAGNOSTIC TROUBLE CODES

P0420 CATALYST EFFICIENCY LOW(B1)

NUMBER OF DTC : 1 ITEMS

Fig. 1



1.2 CURRENT DATA

✕	OXGEN SENSOR-B1/S1	0.11 V
✕	OXGEN SENSOR-B1/S2	0.54 V
✕	A/F CLOSE LOOP	ON
✕	SHORT TERM FUEL-B1	100.6%
✕	LONG TERM FUEL-IDLE	1.2 %
✕	LONG TERM FUEL-P/LOAD	99.9 %
	BATTERY VOLTAGE	13.2 V
	MAP SENSOR	4.5 psi

Fig. 2 Normal data

NOTE

If the wave form of rear HO2S looks similar to that of front HO2S,catalytic converter may be broken.

Service standard
For front HO2S
-When decelerating suddeniy from 4000rpm : 200mV or less
-When engine is suddenly raced : 600~1000mV
-1500rpm : The fluctuation between 400mV or less and 600~1000mV
For Rear HO2S
-Part load(Approx. 2000rpm) : 500~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

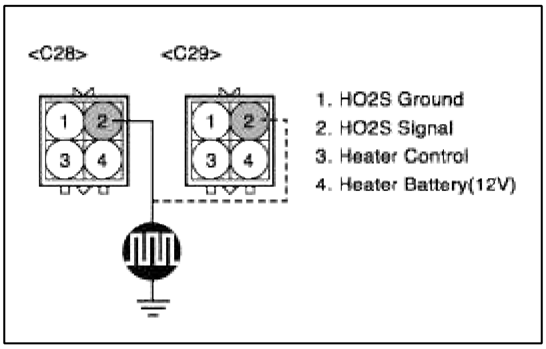
NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Start engine and warm up to operating temperature.

2. Measure waveform between terminal 2(up , down) of sensor harness connector and chassis ground.



3. Are the signal wave forms between front and rear HO2S about the same?

YES

Catalytic converter faulty.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

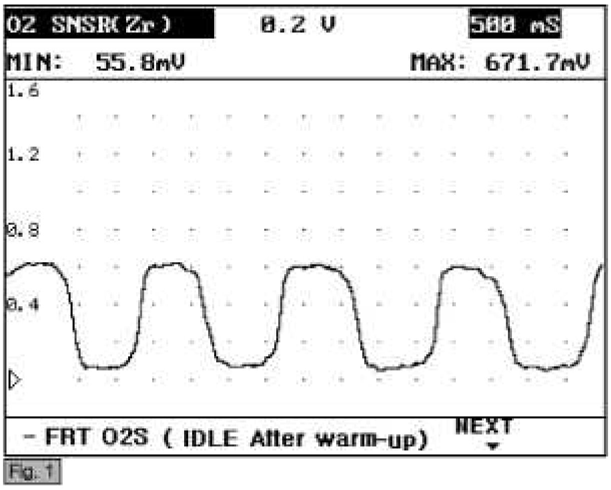


Fig. 1

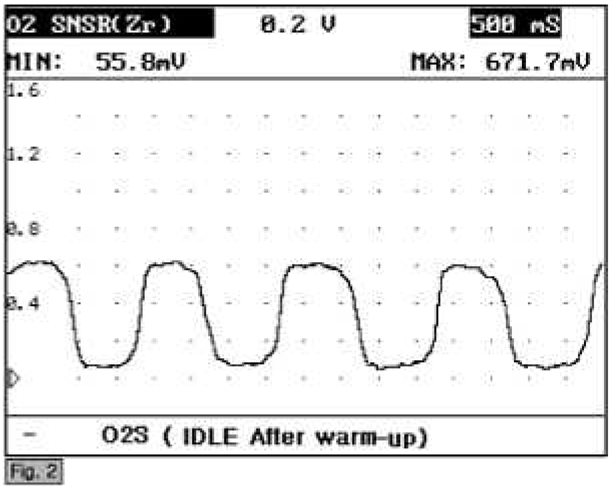


Fig. 2

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

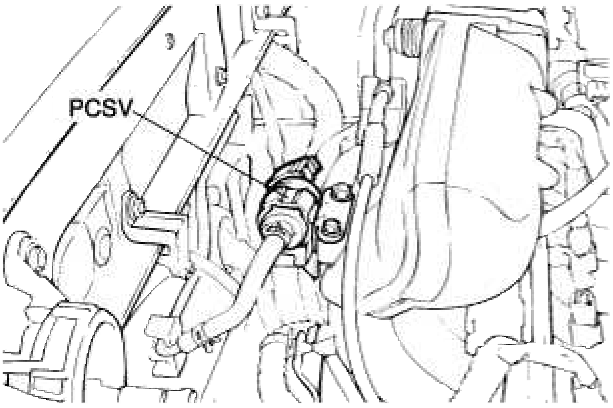
NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

Emission Control System > Troubleshooting > P0441

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

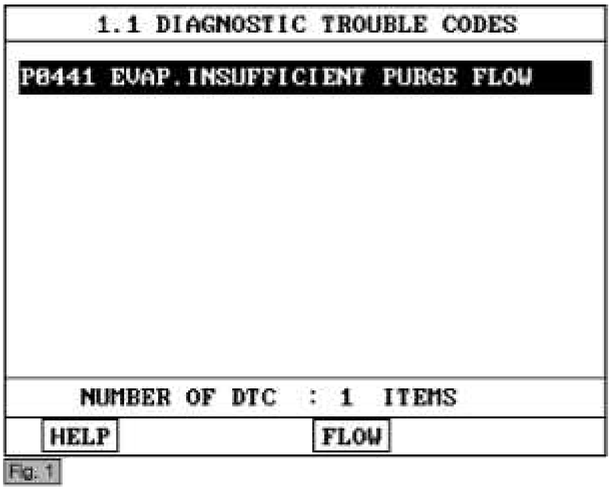
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Rationality check	● Open in battery circuit. ● Open in control circuit. ● Short to ground in control circuit ● Faulty PCSV ● Faulty PCM
Threshold value	● Lambda controller : -0.06-0.06 ● Air mass through idle control valve < 0.8kg/h (1.7637 lb/h)	
Enable Conditions	● During Idle and vehicle standstill ● Coolant temperature > > 70 degC(158 °F) ● Altitude (model) < 2500 m ● Integrated purge mass > 2grams ● Closed loop control enabled	
Diagnostic Time		
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "EVAP.PURGE VALVE" parameter on the scantool.

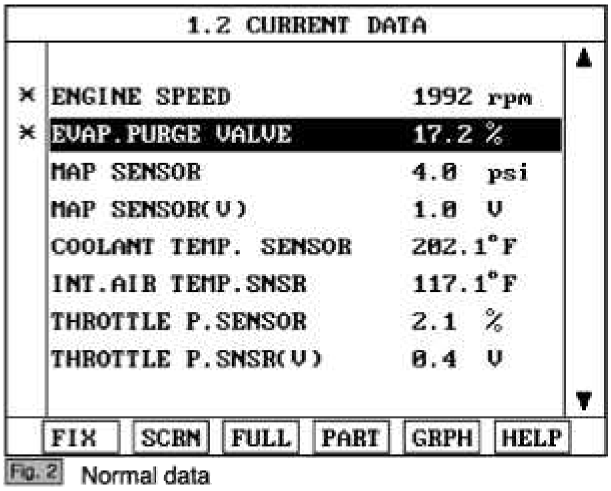


1.1 DIAGNOSTIC TROUBLE CODES

P0441 EVAP.INSUFFICIENT PURGE FLOW

NUMBER OF DTC : 1 ITEMS

Fig. 1



1.2 CURRENT DATA

× ENGINE SPEED	1992	rpm
× EVAP.PURGE VALVE	17.2	%
MAP SENSOR	4.0	psi
MAP SENSOR(V)	1.0	V
COOLANT TEMP. SENSOR	202.1°F	
INT.AIR TEMP.SNSR	117.1°F	
THROTTLE P.SENSOR	2.1	%
THROTTLE P.SNSR(V)	0.4	V

FIX
SCRN
FULL
PART
GRPH
HELP

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
Idle : 0 %
1000~3000 rpm : 1.5 ~ 35 %

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

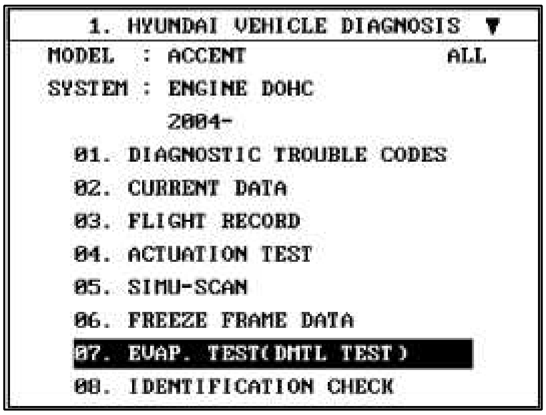
NO

Go to "W/Harness Inspection" procedure.

ACTUATOR TEST MODE

1. Evap. Leakage Test

Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



1. HYUNDAI VEHICLE DIAGNOSIS

MODEL : ACCENT ALL
SYSTEM : ENGINE DOHC
2004-

01. DIAGNOSTIC TROUBLE CODES
02. CURRENT DATA
03. FLIGHT RECORD
04. ACTUATION TEST
05. SIMU-SCAN
06. FREEZE FRAME DATA
07. EVAP. TEST(DMTL TEST)
08. IDENTIFICATION CHECK

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P0441 set again?

YES

Go to "W/Harness Inspection" procedure

NO

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

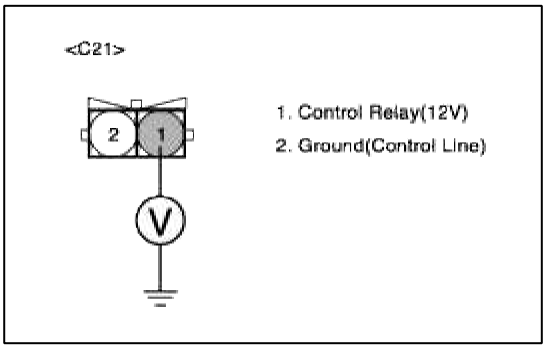
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect PCSV sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of PCSV harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

Open circuit or short circuit to chassis ground between PCSV harness connector and battery power circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case the voltage at terminal 1 of PCSV is 0 V when PCSV is disconnected.
> Possible cause:Open or short circuit in battery power line after fuse(15A INJ)

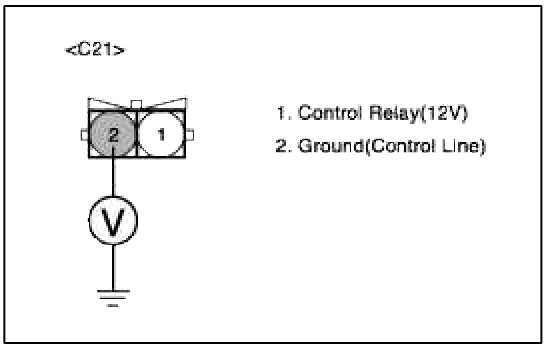
CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"

   (2) Disconnect PCSV sensor connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 2 of PCSV harness connector and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between PCSV harness connector and PCM harness connector.
Short circuit to chassis ground between PCSV harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case the measured voltage is 0V when checking control line
> Possible cause:If the measured voltage indicates 0V,the problem is that control line is open, so check the open circuit between terminal 46 of PCM and terminal 2 of PCSV

COMPONENT INSPECTION

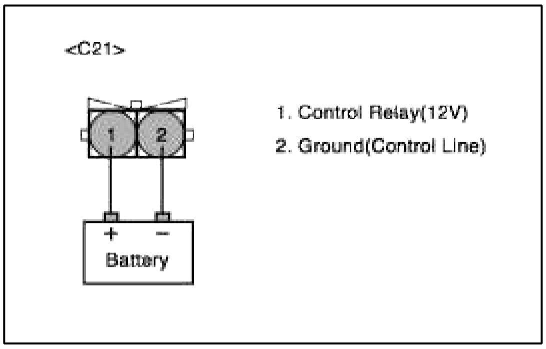
1. Check Operation of PCSV
   (1) Ignition "OFF"

   (2) Disconnect valve connector and Remove Purge Control Valve.

   (3) Check that no air flows through valve.

   (4) Apply 12V and a ground to 1 and 2 terminals of the Purge Control Valve.(To sensor side)

   (5) Verify that air flows through valve



(6) Does Purge Control Valve work properly ?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

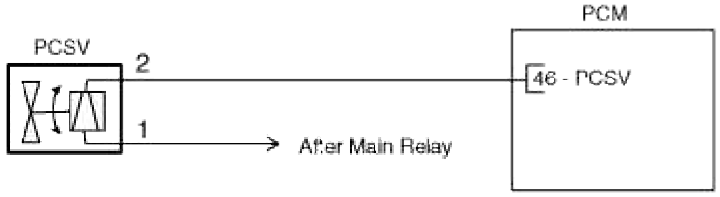
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

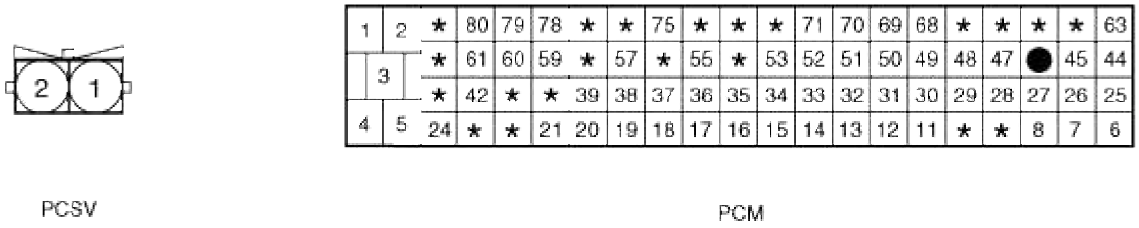
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

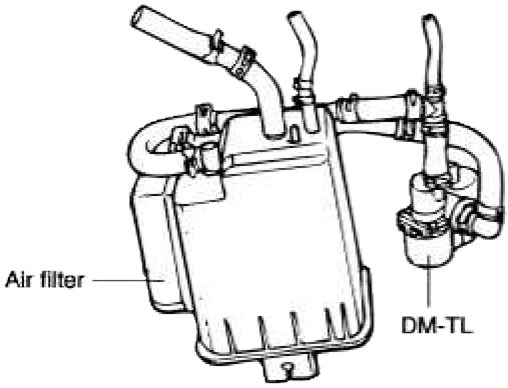
Terminal	Connected to	Function
1	Main Relay	Battery Voltage
2	PCM Terminal 46	PCSV operation

[HARNESS CONNECTORS]



Emission Control System > Troubleshooting > P0442

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

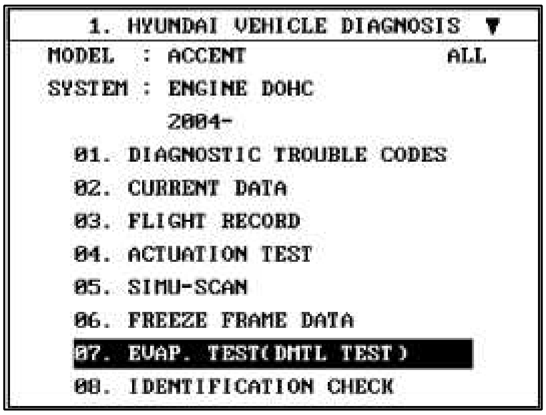
Item		Detecting Condition	Possible cause
Case1	Monitoring Strategy	● Pump motor current at monitor mode (rough leak)	● Fuel filler cap loose or missing. ● Fuel filler cap o-ring missing or damaged. ● Faulty or damaged fuel filler pipe. ● Leaking, disconnected or plugged fuel vapor lines. ● Fuel in lines due to faulty rollover(RV),on-board vapor recovery valve(ORVR valve). ● Improperly installed purge solenoid (PSV). ● PSV stuck open or closed. ● Leaking canister or catch tank ● Faulty leak detection module solenoid valve. ● Faulty leak detection module. ● Faulty PCM
	Threshold value	● Increment of pump motor current < 1.08-2.34 mA	
	Enable Conditions	● PCM at power down ● Last soak time (model) > 5 hrs ● Duration of driving > 20 min ● Fuel tank level 15-85 % ● Ambient temp. (model) 1.5-40.5 degC(34.7~104.9 °F) ● Altitude (model) < 2500 m ● Battery voltage 11.5-14.5 V	
	Diagnostic Time		
Case1	Monitoring Strategy	● Pump motor current at monitor mode (small leak)	
	Threshold value	● Elapsed time to increase 0.5mA < 19-28 sec	
	Enable Conditions	● Refueling > 5 L	
	Diagnostic Time		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).

2. Warm up the engine to normal operating temperature.
3. Evap. Leakage Test

   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
     1. HYUNDAI VEHICLE DIAGNOSIS ▼
  MODEL  : ACCENT            ALL
  SYSTEM : ENGINE DOHC
           2004-
    01. DIAGNOSTIC TROUBLE CODES
    02. CURRENT DATA
    03. FLIGHT RECORD
    04. ACTUATION TEST
    05. SIMU-SCAN
    06. FREEZE FRAME DATA
    07. EVAP. TEST(DMTL TEST)
    08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P0442 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Component Inspection" procedure.

COMPONENT INSPECTION

1. Check Fuel Filler Cap
   (1) Warm-up engine to normal operating temperature.

   (2) Check fuel filler cap, o-ring seal for being tightly installed, and in good condition.

   (3) Verify cap releases vacuum at specified values (approximately 2psi pressure and approximately 1.5 inches hg vacuum)

   (4) Are cap, o-ring and release pressures OK?

   YES

   Go to "Check Fuel Filler Pipe" as below

   NO

   Substitute with a known-good Fuel Filler Cap and check for proper operation. If the problem is corrected, replace Fuel Filler Cap and then go to "Verification of Vehicle Repair" procedure.

2. Check Fuel Filler Pipe
   (1) Check fuel filler pipe for cracks, damage and o-ring seat for deformation.

   (2) Is fuel filler pipe okay?

   YES

   Go to "Thoroughly check all Fuel vapor hoses clamps " as below

   NO

   Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

3. Thoroughly check all Fuel vapor hoses clamps between;
   Canister and rollover valve.
   Canister and ORVR valves.
   Canister and catcher tank.
   Canister and DMTL.
   Canister and PSV.
   PSV and intake manifold(At this point, verify arrow on PSV is pointing towards intake manifold. If it is not, reverse installation).
   (1) With system sealed and pressurized, check for leaks with a R134a leak detector.

   (2) Are vapor hoses and clamps okay?

   YES

   Go to "Check PSV" as below

   NO

   Replace all cracked/damaged hoses loose clamps go to "Verification Vehicle Repair" procedure.

4. Check PSV
   (1) Turn ignition OFF and disconnect hose leading from PSV to intake manifold at PSV. Draw a vacuum at nipple and verify PSV hold vacuum. Turn ignition to ON and jumper a wire to chassis ground at PSV control terminal 1 (should hear a faint click from PSV). Vacuum chould bleed off. Repeat this procedure 4 or 5 times to ensure PSV reliadility.

   (2) Is PSV working properly?

   YES

   Go to "Check DM-TL" as below

   NO

   Substitute with a known-good PCV and check for proper operation. If the problem is corrected, replace PCV and then go to "Verification of Vehicle Repair" procedure.

5. Check DM-TL

   (1) Temporarily install a new DM-TL and check for proper operation.

   (2) Is problem still remained ?

YES

Substitute with a known-good DM-TL and check for proper operation. If the problem is corrected, replace DM-TL and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

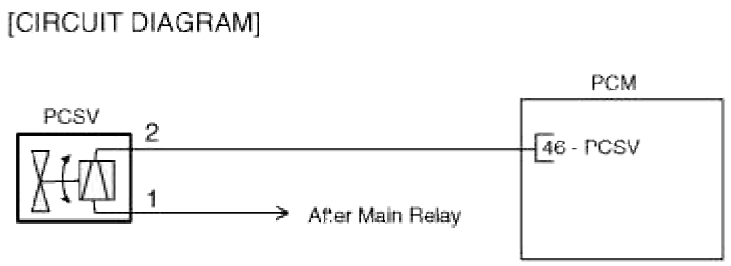
YES

Go to the applicable troubleshooting procedure.

NO

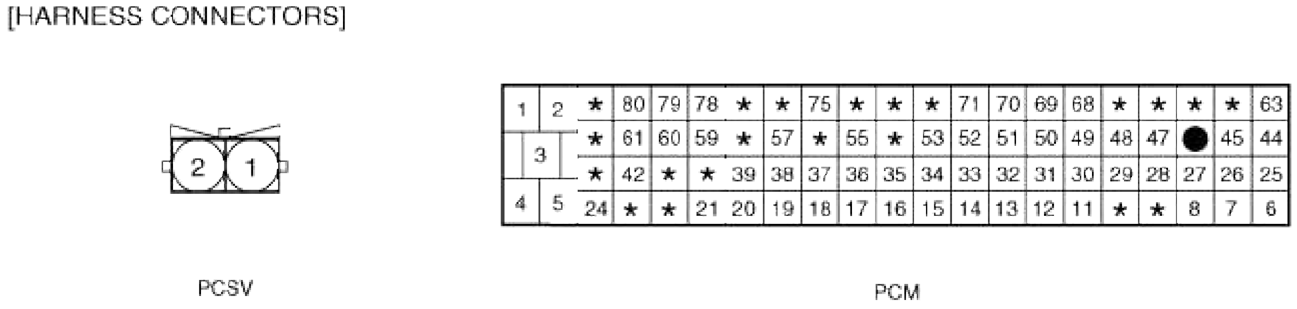
System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
PCSV
2
1
After Main Relay
PCM
46 - PCSV

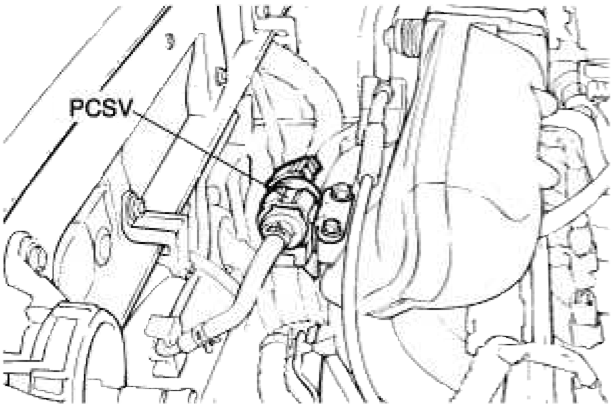
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage
2	PCM Terminal 46	PCSV operation


[HARNESS CONNECTORS]
2 1
PCSV
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 ● 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

Emission Control System > Troubleshooting > P0444

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

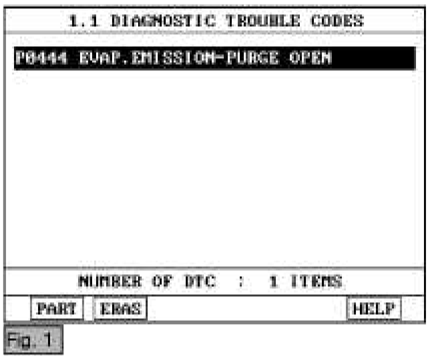
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check, low	● Open in battery circuit ● Open in control circuit ● Short to ground in control circuit ● Faulty PCSV ● Faulty PCM
Threshold value	● Short circuit to ground or disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continous	
Fail Safe	● None	

MONITOR DTC STATUS

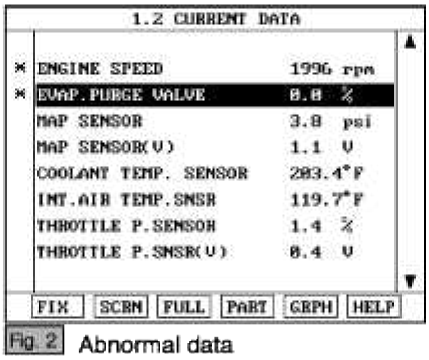
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "EVAP.PURGE VALVE" parameter on the scantool.



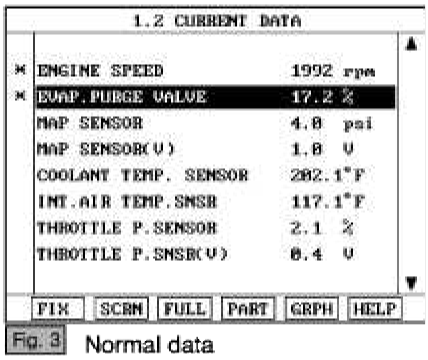
```
1.1 DIAGNOSTIC TROUBLE CODES
P0444 EVAP.EMISSION-PURGE OPEN

NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* ENGINE SPEED          1996 rpm
* EVAP.PURGE VALVE      0.0  %
  MAP SENSOR            3.0  psi
  MAP SENSOR(V)         1.1  V
  COOLANT TEMP. SENSOR  203.4°F
  INT.AIR TEMP.SNSR     119.7°F
  THROTTLE P.SENSOR     1.4  %
  THROTTLE P.SNSR(V)    0.4  V
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED          1992 rpm
* EVAP.PURGE VALVE      17.2 %
  MAP SENSOR            4.0  psi
  MAP SENSOR(V)         1.0  V
  COOLANT TEMP. SENSOR  202.1°F
  INT.AIR TEMP.SNSR     117.1°F
  THROTTLE P.SENSOR     2.1  %
  THROTTLE P.SNSR(V)    0.4  V
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
Idle : 0 %
1000~3000 rpm : 1.5 ~ 35 %

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

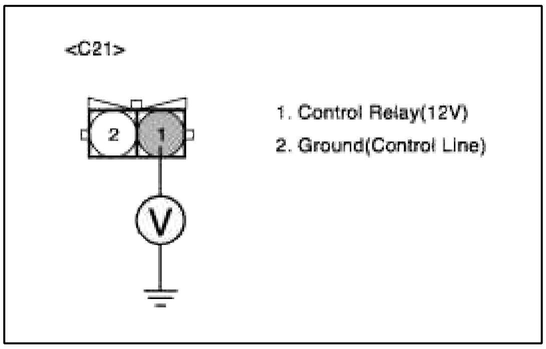
NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect PCSV sensor connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 1 of PCSV harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

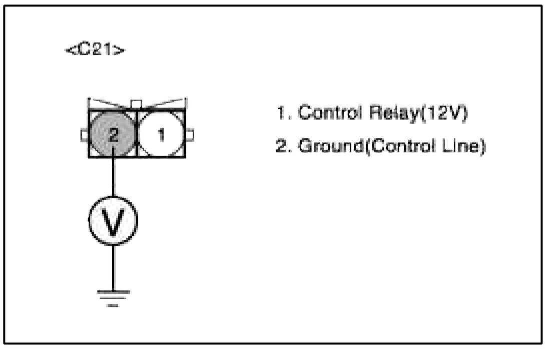
NO

Open circuit or short circuit to chassis ground between PCSV harness connector and battery power circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case the voltage at terminal 1 of PCSV is 0 V when PCSV is disconnected.
> Possible cause:Open or short circuit in battery power line after fuse(15A INJ)

CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   - (1) Ignition "OFF"
   - (2) Disconnect PCSV sensor connector.
   - (3) Ignition "ON" & Engine "OFF"
   - (4) Measure voltage between terminal 2 of PCSV harness connector and chassis ground.



(5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

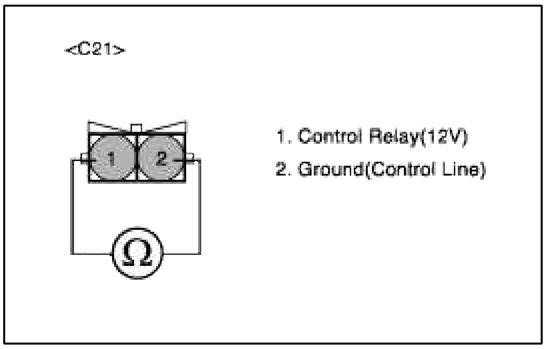
Open circuit between PCSV harness connector and PCM harness connector.
Short circuit to chassis ground between PCSV harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case the measured voltage is 0V when checking control line
> Possible cause:If the measured voltage indicates 0V,the problem is that control line is open,so check the open circuit between terminal 46 of PCM and terminal 2 of PCSV

COMPONENT INSPECTION

1. Check PCSV

(1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



(2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

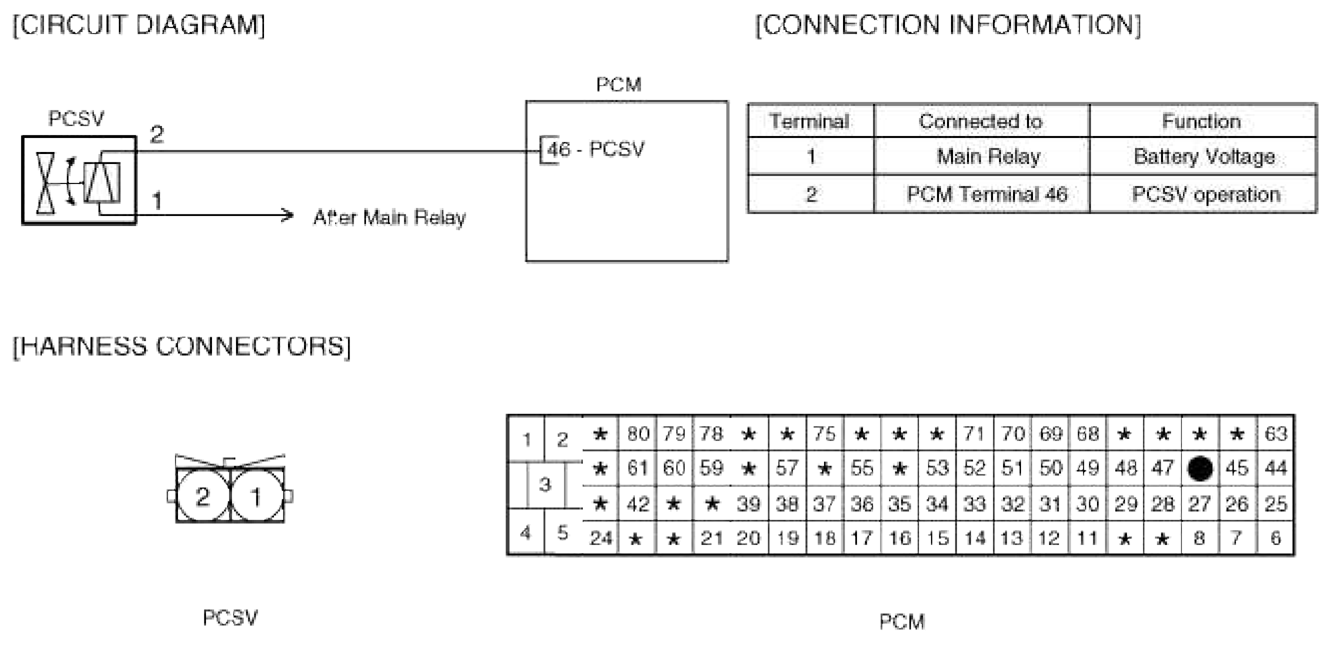
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
PCSV
2
1
After Main Relay
PCM
46 - PCSV
[HARNESS CONNECTORS]
2
1
PCSV
PCM

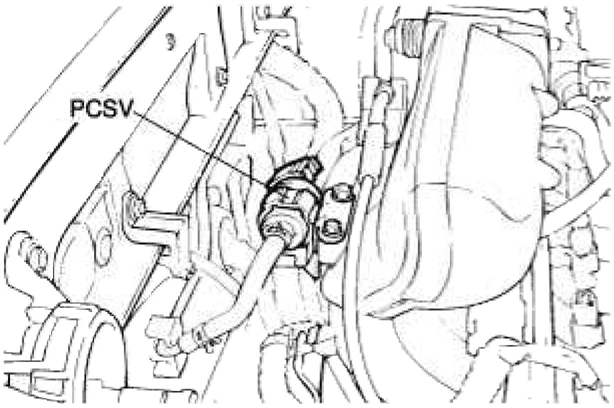
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage
2	PCM Terminal 46	PCSV operation

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	●	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Emission Control System > Troubleshooting > P0445

COMPONENT LOCATION



GENERAL DESCTIPTION

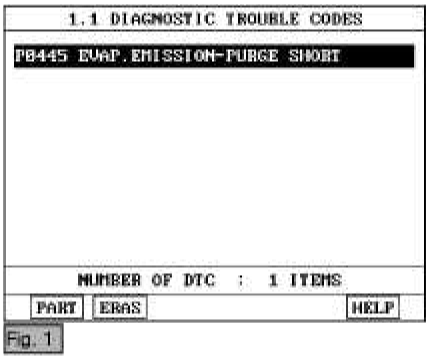
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check, high	● Short to battery in control circuit ● Faulty PCSV ● Faulty PCM
Threshold value	● Short circuit to battery	
Enable Conditions	● Short circuit	
Diagnostic Time	● Continous	
Fail Safe	● None	

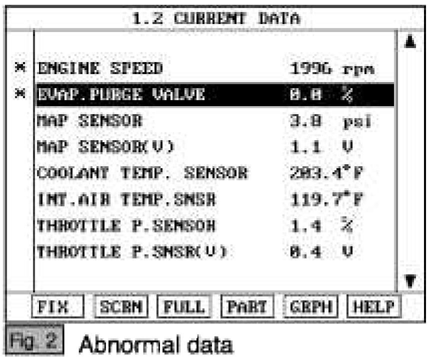
MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "EVAP.PURGE VALVE" parameter on the scantool.



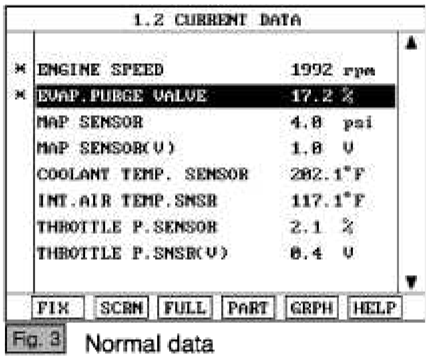
```
1.1 DIAGNOSTIC TROUBLE CODES
P0445 EVAP.EMISSION-PURGE SHORT

NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* ENGINE SPEED              1996 rpm
* EVAP.PURGE VALVE          0.0  %
  MAP SENSOR                3.0  psi
  MAP SENSOR(V)             1.1  V
  COOLANT TEMP. SENSOR      203.4°F
  INT.AIR TEMP.SNSR         119.7°F
  THROTTLE P.SENSOR         1.4  %
  THROTTLE P.SNSR(V)        0.4  V
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED              1992 rpm
* EVAP.PURGE VALVE          17.2 %
  MAP SENSOR                4.0  psi
  MAP SENSOR(V)             1.0  V
  COOLANT TEMP. SENSOR      202.1°F
  INT.AIR TEMP.SNSR         117.1°F
  THROTTLE P.SENSOR         2.1  %
  THROTTLE P.SNSR(V)        0.4  V
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
Idle : 0 %
1000~3000 rpm : 1.5 ~ 35 %

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

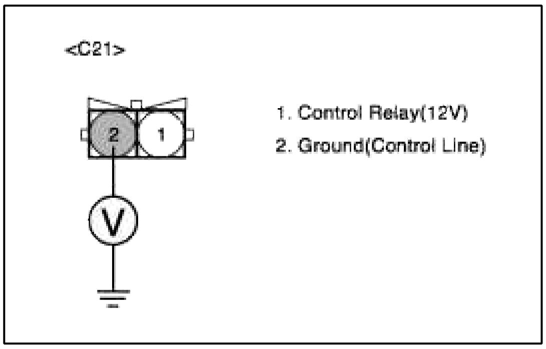
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

CONTROL CIRCUIT INSPECTION

1. Check for short to power in harness
   - (1) Ignition "OFF"
   - (2) Disconnect PCSV sensor connector.
   - (3) Ignition "ON" & Engine "OFF"
   - (4) Measure voltage between terminal 2 of PCSV harness connector and chassis ground.



(5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

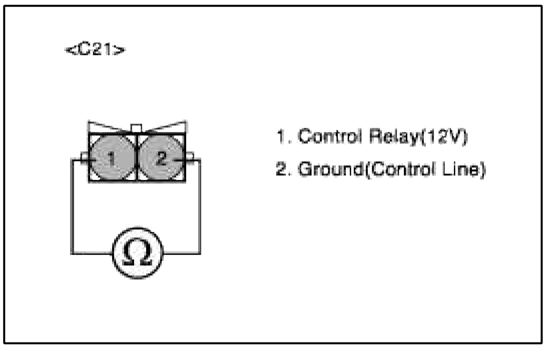
NO

Short circuit to chassis ground between PCSV harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case the voltage at terminal 1 of PCSV is 12 V when PCSV is disconnected.
> Possible cause : Short circuit in battery power line after fuse(15A INJ)

COMPONENT INSPECTION

1. Check PCSV
    (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



    (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCSV and check for proper operation. If the problem is corrected, replace PCSV and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

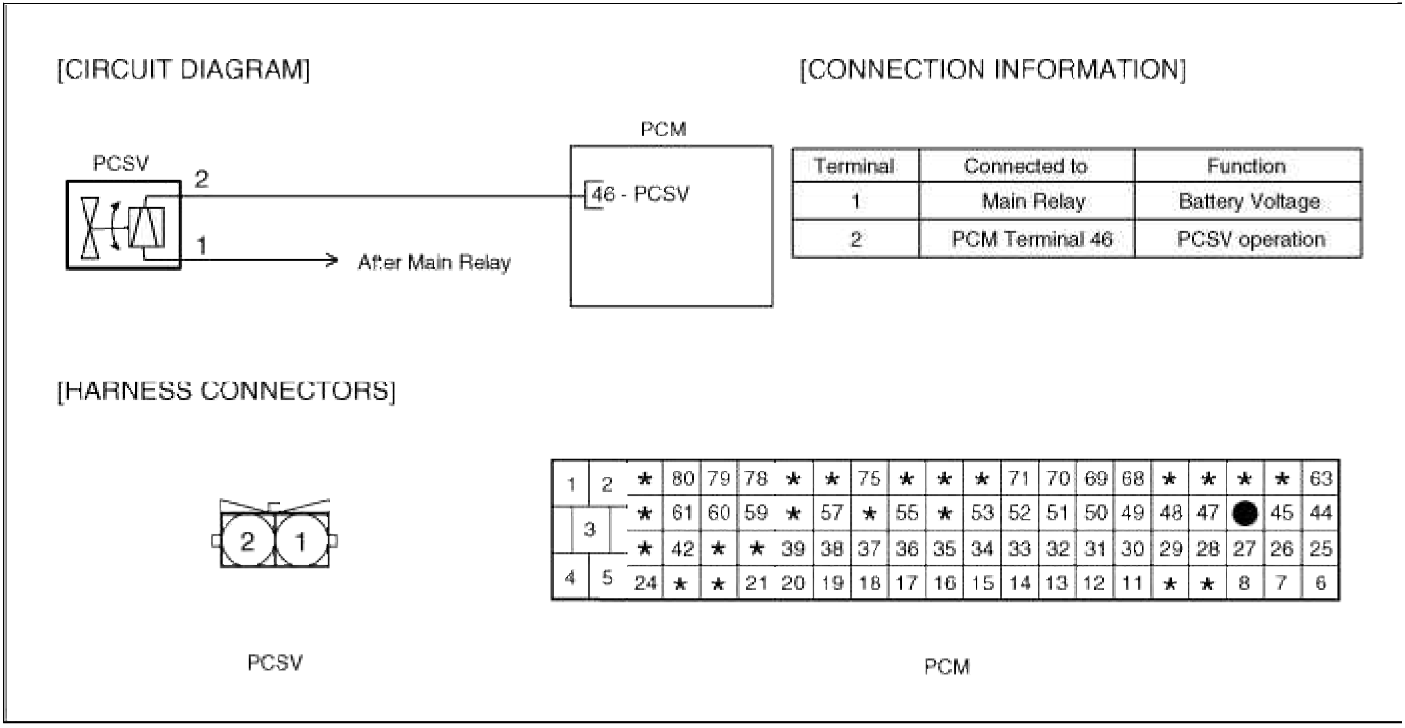
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
PCSV
2
1
After Main Relay
PCM
46 - PCSV
[HARNESS CONNECTORS]
2
1
PCSV
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 ● 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Main Relay	Battery Voltage
2	PCM Terminal 46	PCSV operation

Emission Control System > Troubleshooting > P2400

COMPONENT LOCATION

GENERAL DESCTIPTION

DTC DESCRIPTION

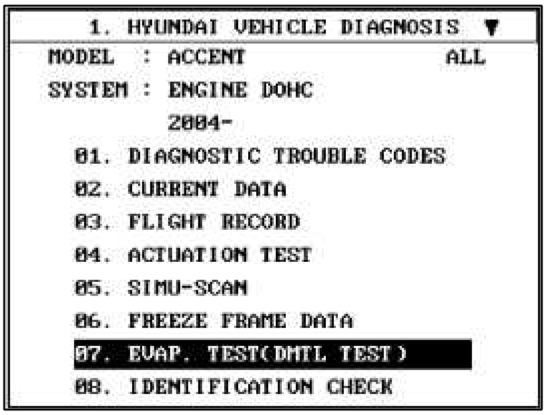
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check (Pump motor)	● Open in control circuit. ● Faulty DMTL. ● Faulty PCM.
Threshold value	● Disconnected	
Enable Conditions	● open circuit	
Diagnostic Time	● Continuous	
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Evap. Leakage Test
   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
   1. HYUNDAI VEHICLE DIAGNOSIS  ▼
 MODEL  : ACCENT            ALL
 SYSTEM : ENGINE DOHC
          2004-
   01. DIAGNOSTIC TROUBLE CODES
   02. CURRENT DATA
   03. FLIGHT RECORD
   04. ACTUATION TEST
   05. SIMU-SCAN
   06. FREEZE FRAME DATA
   07. EVAP. TEST(DMTL TEST)
   08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P2400 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

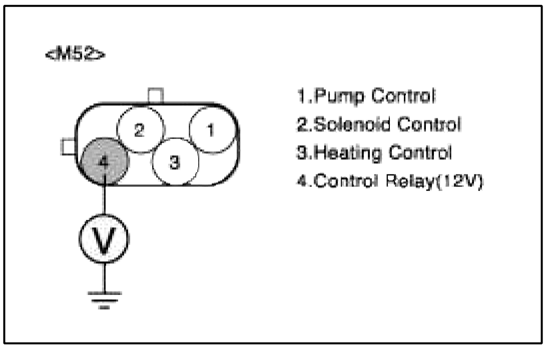
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 4 of DM-TL harness connector and chassis ground.


<M52>
1
2
3
4
V
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

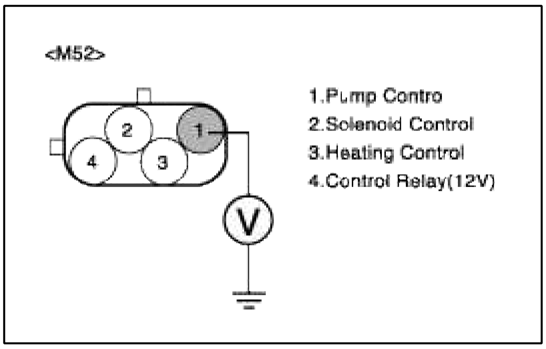
Short circuit to chassis ground between DM-TL harness connector and control relay.
Open circuit between DM-TL harness connector and control relay.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

1. In case,when DM-TL connector is disconnected, the voltage of DM-TL terminal 4 is 0V.
   Possible cause: Open or short circuit in battery power line after fuse (10A ECU #1).
2. ECM also sets P0444 and P0562 if it detects the open circuit in DM-TL power line.

CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect DM-TL connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 1 of DM-TL harness connector and chassis ground.


<M52>
1
2
3
4
V
1.Pump Contro
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

(5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

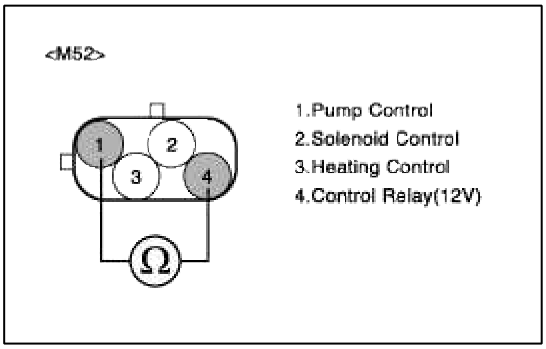
NO

Short circuit to chassis ground between DM-TL harness connector and PCM harness connector
Open circuit between DM-TL harness connector and PCM harness connector
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the DM-TL connector is disconnected,the voltage of DM-TL terminal 1 is 0 V.
> Possible cause: Open or short between terminal 30 of PCM and terminal 1 of DM-TL.

COMPONENT INSPECTION

1. Check for short between Pump Control and battery.
   (1) Ignition "OFF"
   (2) Disconnect Fuel sender connector.
   (3) Measure resistance between terminal 1 and 4 of Fuel sender harness connector.(To sender side)



   (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Pump motor and check for proper operation. If the problem is corrected, replace Pump motor and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

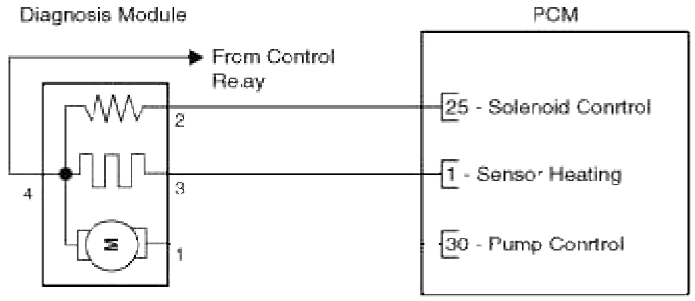
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

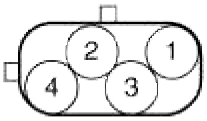
[CIRCUIT DIAGRAM]


Diagnosis Module
PCM
From Control Relay
2
3
4
1
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

[HARNESS CONNECTORS]



Diagnosis Module

●	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	●	29	28	27	26	●
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Emission Control System > Troubleshooting > P2401

COMPONENT LOCATION

GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

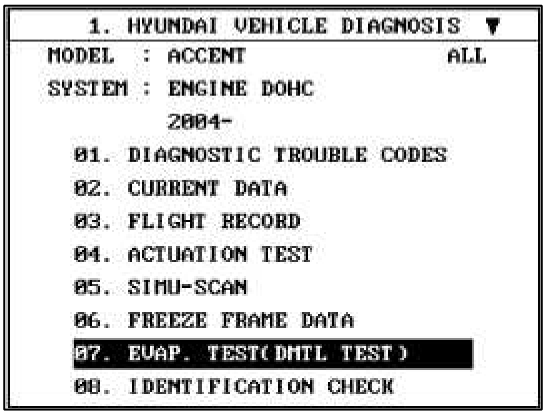
Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check (Pump motor)	● Open in control circuit ● Short to ground in control circuit. ● Faulty DMTL. ● Faulty PCM
Threshold value	● Shorted to GND	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Evap. Leakage Test

   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
1. HYUNDAI VEHICLE DIAGNOSIS ▼
MODEL  : ACCENT            ALL
SYSTEM : ENGINE DOHC
         2004-
  01. DIAGNOSTIC TROUBLE CODES
  02. CURRENT DATA
  03. FLIGHT RECORD
  04. ACTUATION TEST
  05. SIMU-SCAN
  06. FREEZE FRAME DATA
  07. EVAP. TEST(DMTL TEST)
  08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P2401 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

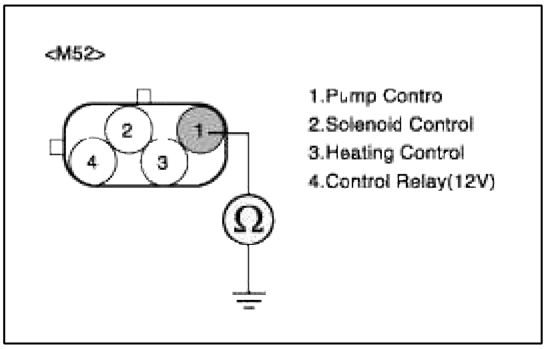
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

CONTROL CIRCUIT INSPECTION

1. Check for short to ground in harness
    (1) Ignition "OFF"
    (2) Disconnect DM-TL connector and PCM connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure resistance between terminal 1 of DM-TL harness connector and chassis ground..


<M52>
1
2
3
4
Ω
1.Pump Contro
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

    (5) Is measure resistance within Specification?

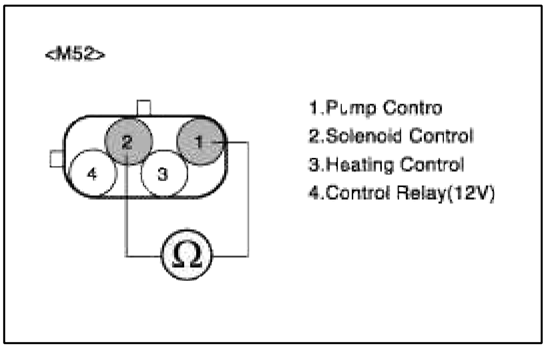
YES

Go to "Check for short between Pump Control and Solenoid Control harness " as below.

NO

Short circuit to chassis ground between DM-TL harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for short between Pump Control and Solenoid Control harness
    (1) Ignition "OFF"
    (2) Disconnect DM-TL connector and PCM connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure resistance between terminal 1 and 2 of DM-TL harness connector.


<M52>
1
2
3
4
Ω
1.Pump Contro
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

    (5) Is measure resistance within Specification?

YES

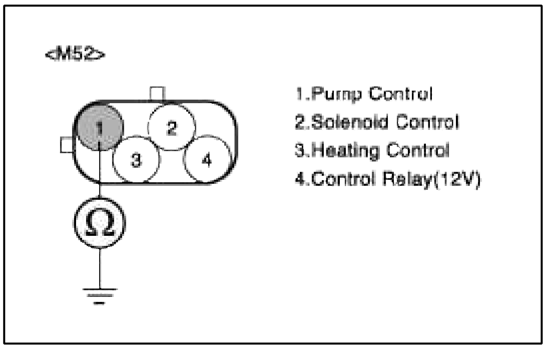
Go to "Component Inspection" procedure.

NO

Shorted circuit between Pump Control circuit and Solenoid Control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for short between Pump Control and chassis ground.
    (1) Ignition "OFF"
    (2) Disconnect DM-TL connector.
    (3) Measure resistance between terminal 1 of DM-TL harness connector and chassis ground.(To DM-TL side)



    (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Pump motor and check for proper operation. If the problem is corrected, replace Pump motor and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

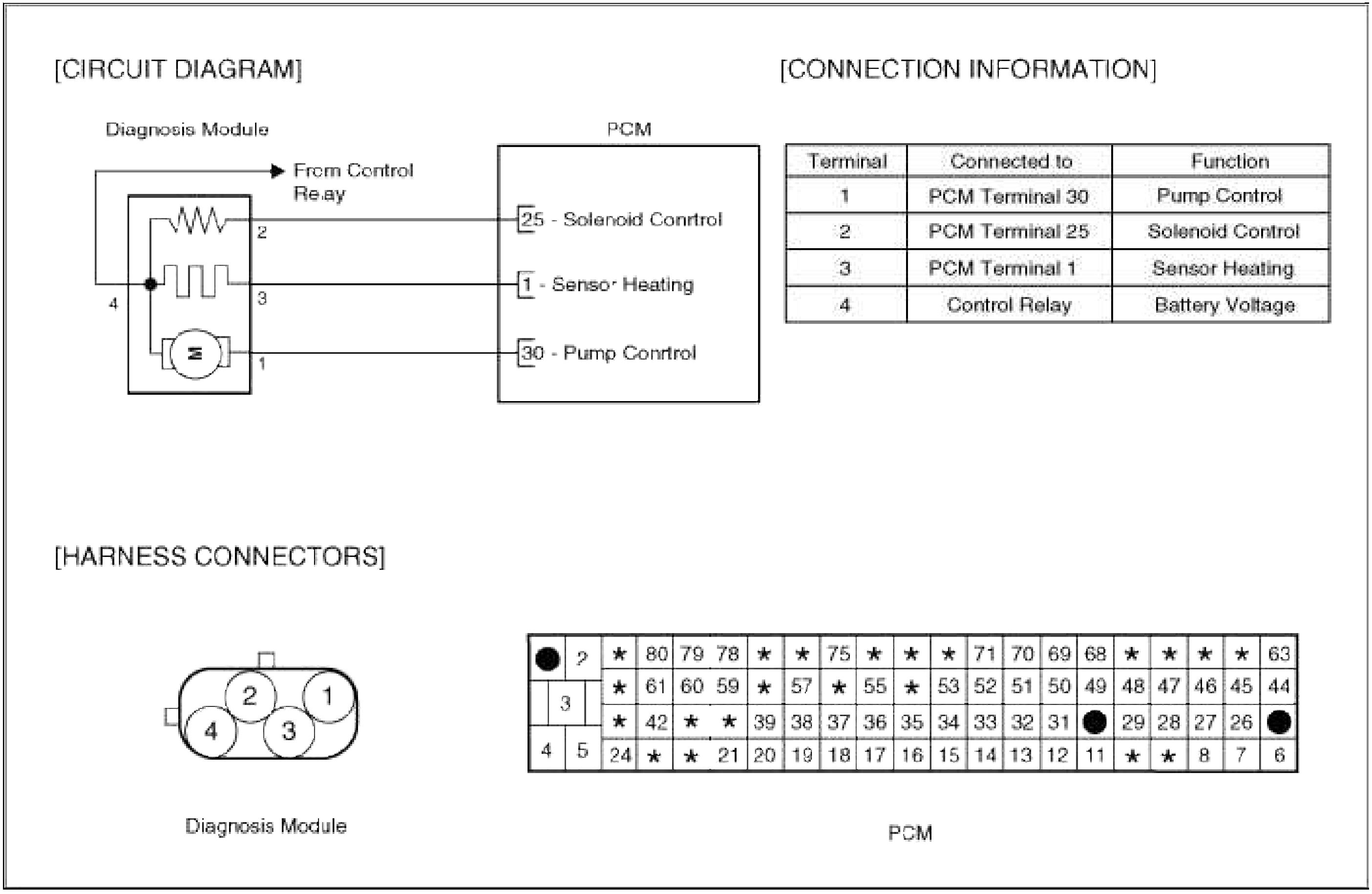
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
Diagnosis Module
From Control Relay
PCM
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol
1
2
3
4
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
Diagnosis Module
PCM

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

Emission Control System > Troubleshooting > P2402

COMPONENT LOCATION

GENERAL DESCTIPTION

DTC DESCRIPTION

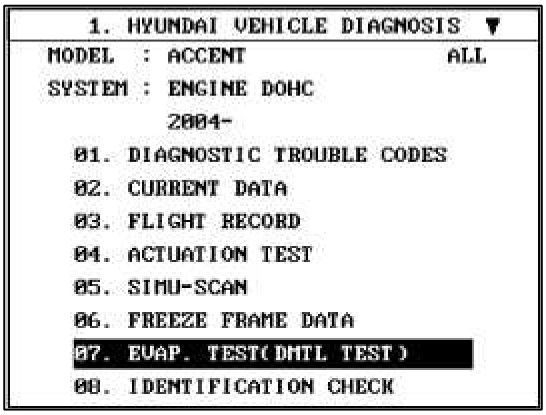
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check (Pump motor)	● Short to battery in control circuit ● Faulty DMTL. ● Faulty PCM
Threshold value	● Shorted to battery voltage	
Enable Conditions	● Shorted circuit	
Diagnostic Time	● Continuous	
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Evap. Leakage Test
   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
     1. HYUNDAI VEHICLE DIAGNOSIS ▼
 MODEL  : ACCENT              ALL
 SYSTEM : ENGINE DOHC
               2004-
   01. DIAGNOSTIC TROUBLE CODES
   02. CURRENT DATA
   03. FLIGHT RECORD
   04. ACTUATION TEST
   05. SIMU-SCAN
   06. FREEZE FRAME DATA
   07. EVAP. TEST(DMTL TEST)
   08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P2402 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

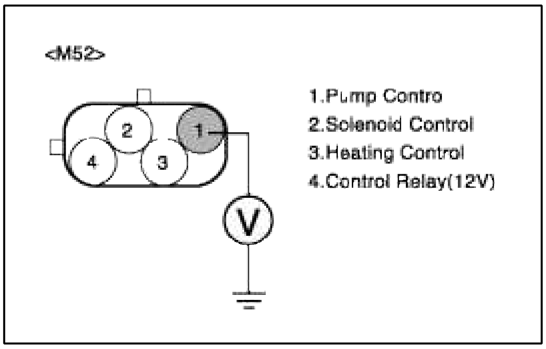
CONTROL CIRCUIT INSPECTION

1. Check for short between battery and Pump control harness
   (1) Ignition "OFF"

   (2) Disconnect DM-TL connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 1 of DM-TL harness connector and chassis ground.


<M52>
1
2
3
4
V
1.Pump Contro
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Check for short to battery in Pump control harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

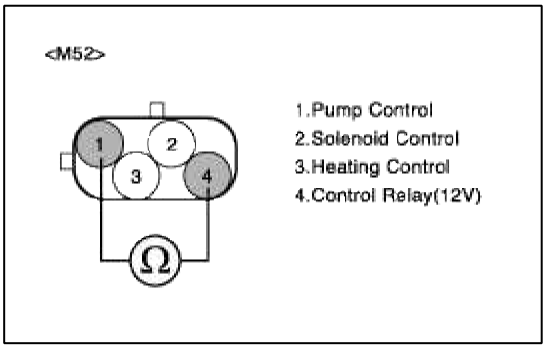
In case,when the DM-TL connector is disconnected,the voltage of DM-TL terminal 4 is 12 V.
Possible cause: Short circuit in battery power line after fuse. (10A ECU #1)

COMPONENT INSPECTION

1. Check for short between Pump Control and battery.
   (1) Ignition "OFF"

   (2) Disconnect DM-TL connector.

   (3) Measure resistance between terminal 1 and 4 of Fuel sender harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Pump motor and check for proper operation. If the problem is corrected, replace Pump motor and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

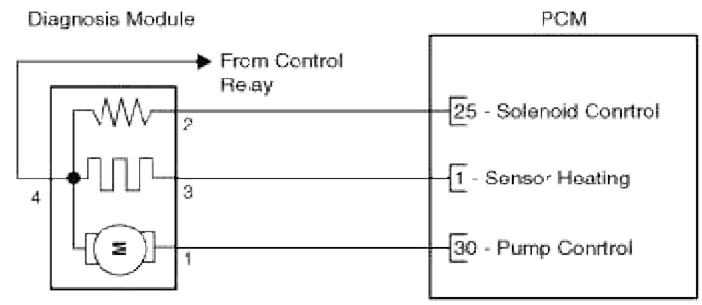
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

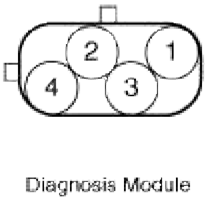
[CIRCUIT DIAGRAM]


Diagnosis Module
From Control Relay
PCM
2
3
4
1
M
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

[HARNESS CONNECTORS]


2
1
4
3
Diagnosis Module

●	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	●	29	28	27	26	●
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Emission Control System > Troubleshooting > P2404

COMPONENT LOCATION

GENERAL DESCTIPTION

DTC DESCRIPTION

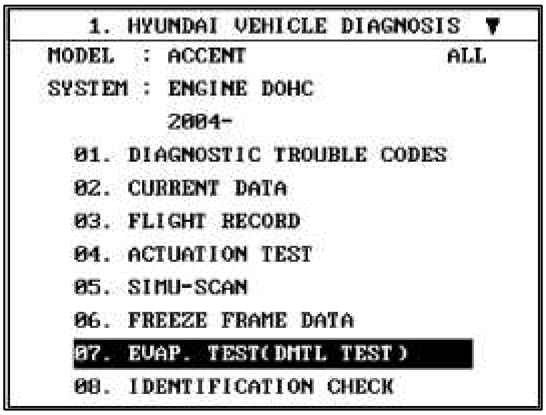
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● DM-TL : pump motor current	● Leakage on EVAP. SYSTEM ● Faulty DMTL. ● Faulty PCM
Threshold value	● Current at valve check > ref. current-2 mA	
Enable Conditions		
Diagnostic Time	● 1.5-2.5 s	
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Evap. Leakage Test

   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
     1. HYUNDAI VEHICLE DIAGNOSIS  ▼
  MODEL  : ACCENT              ALL
  SYSTEM : ENGINE DOHC
           2004-
    01. DIAGNOSTIC TROUBLE CODES
    02. CURRENT DATA
    03. FLIGHT RECORD
    04. ACTUATION TEST
    05. SIMU-SCAN
    06. FREEZE FRAME DATA
    07. EVAP. TEST(DMTL TEST)
    08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P2404 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

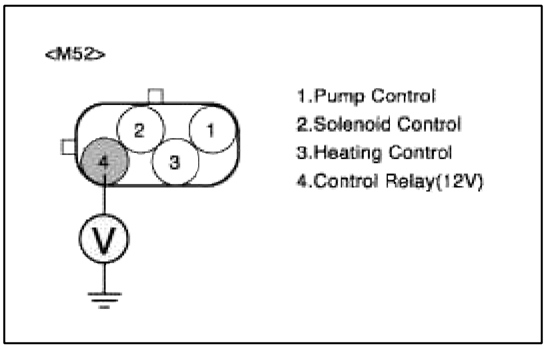
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit insepction" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of DM-TL harness connector and chassis ground.


<M52>
1
2
3
4
V
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

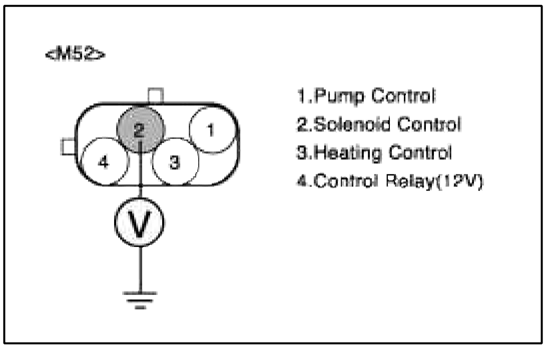
NO

Check for open or short circuit between Main relay and terminal 3 of DM-TL

Especially check "10A ECU" fuse is blown or not installed Repair as necessary and go to "Verification Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of DM-TL harness connector and chassis ground.


<M52>
2
1
4
3
V
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

5. Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Check for Open or short in Solenoid Control harness.

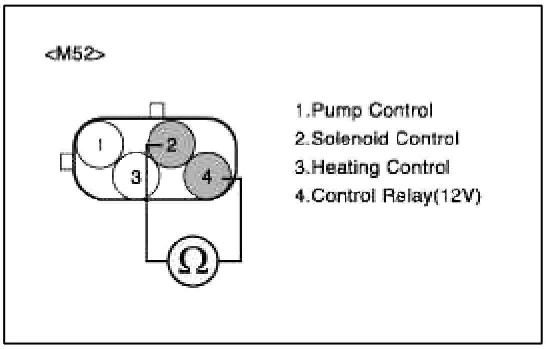
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Solenoid
   (1) Ignition "OFF"

   (2) Disconnect DM-TL connector.

   (3) Measure resistance between terminal 2 and 4 of DM-TL harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (4) Is measure resistance within Specification?

YES

Go to "Check Pump" as below.

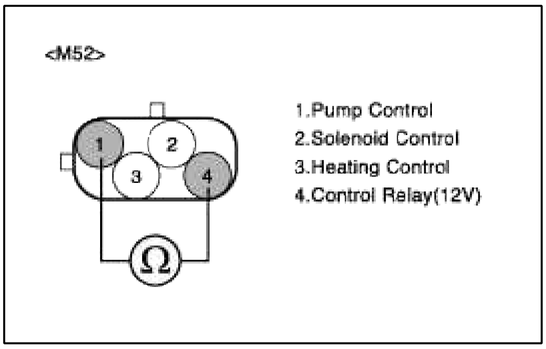
NO

Substitute with a known-good DM-TL and check for proper operation. If the problem is corrected, replace DM-TL and then go to "Verification of Vehicle Repair" procedure.

2. Check Pump
   (1) Ignition "OFF"

   (2) Disconnect DM-TL connector.

   (3) Measure resistance between terminal 1 and 4 of DM-TL harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good DM-TL and check for proper operation. If the problem is corrected, replace DM-TL and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

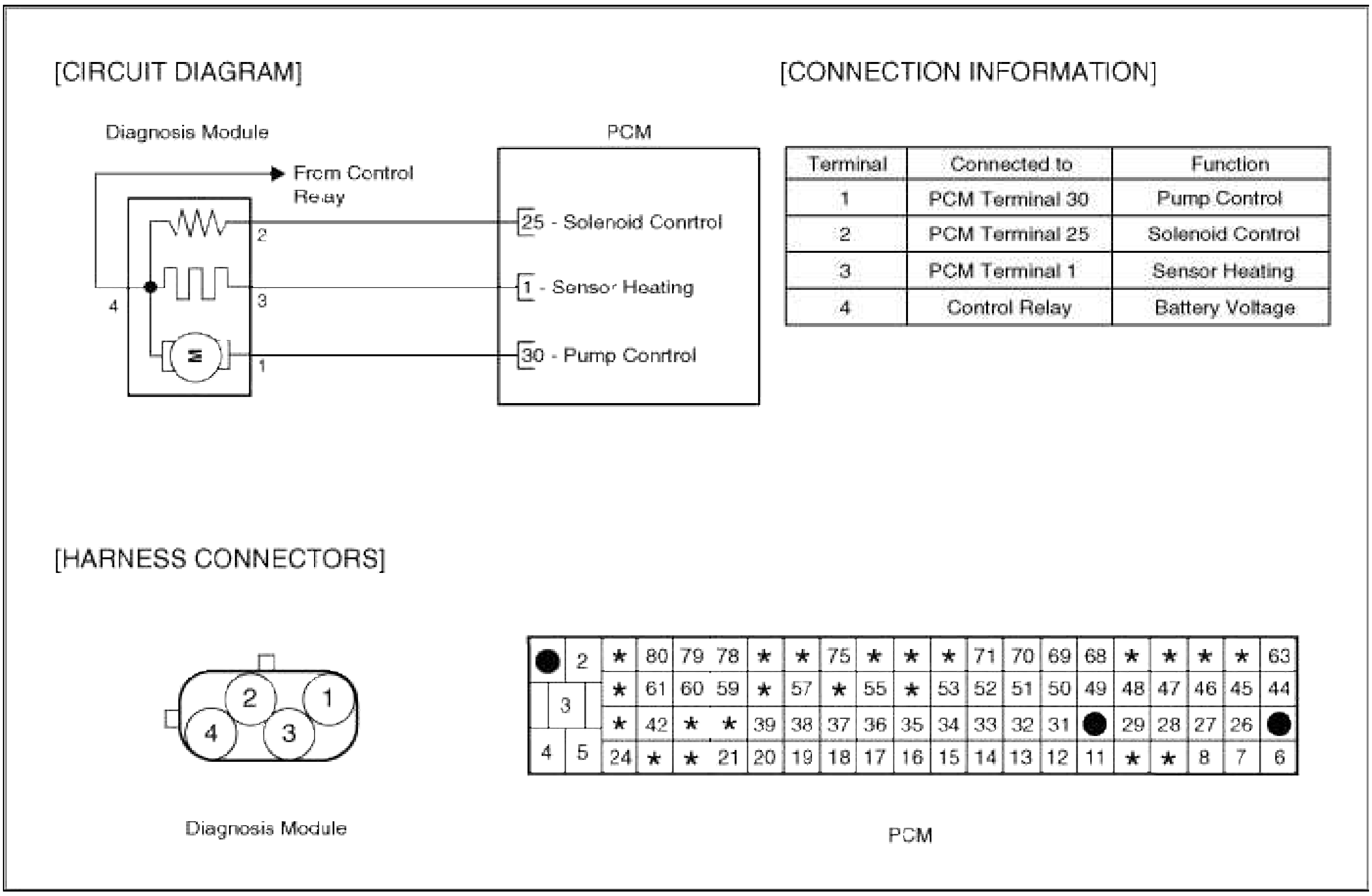
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
Diagnosis Module
From Control Relay
2
3
4
1
PCM
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol
[HARNESS CONNECTORS]
2
1
4
3
Diagnosis Module
PCM

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

●	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
	3	★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	●	29	28	27	26	●
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Emission Control System > Troubleshooting > P2405

COMPONENT LOCATION

GENERAL DESCTIPTION

DTC DESCRIPTION

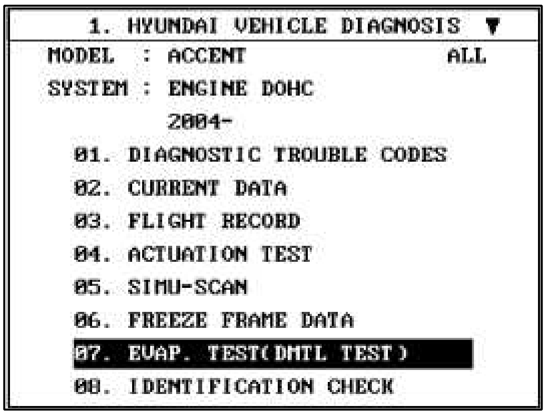
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● DM-TL : pump motor current	● Leakage on EVAP. SYSTEM ● Faulty DMTL. ● Faulty PCM
Threshold value	● Current at reference mode phase < 12 Ma	
Enable Conditions		
Diagnostic Time	● 10 sec	
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Evap. Leakage Test

   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
     1. HYUNDAI VEHICLE DIAGNOSIS  ▼
 MODEL  : ACCENT              ALL
 SYSTEM : ENGINE DOHC
          2004-
   01. DIAGNOSTIC TROUBLE CODES
   02. CURRENT DATA
   03. FLIGHT RECORD
   04. ACTUATION TEST
   05. SIMU-SCAN
   06. FREEZE FRAME DATA
   07. EVAP. TEST(DMTL TEST)
   08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P2405 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

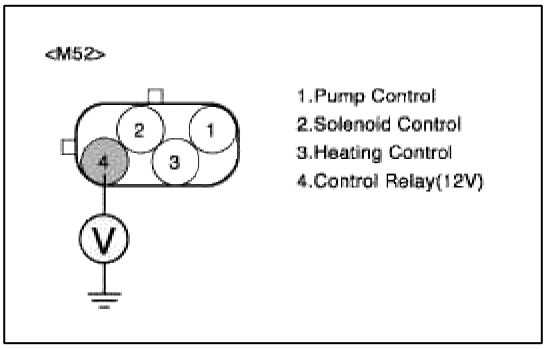
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit insepction" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of DM-TL harness connector and chassis ground.


<M52>
2
1
4
3
V
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

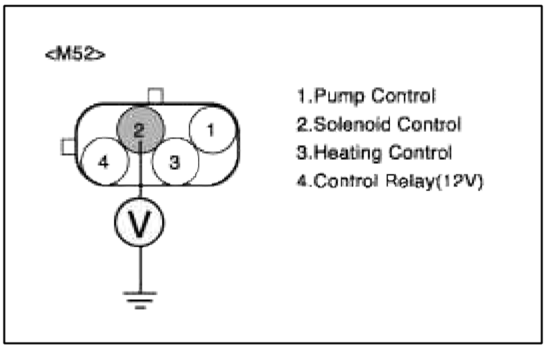
NO

Check for open or short circuit between Main relay and terminal 3 of DM-TL

Especially check "10A ECU" fuse is blown or not installed Repair as necessary and go to "Verification Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of DM-TL harness connector and chassis ground.


<M52>
2
1
4
3
V
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

5. Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

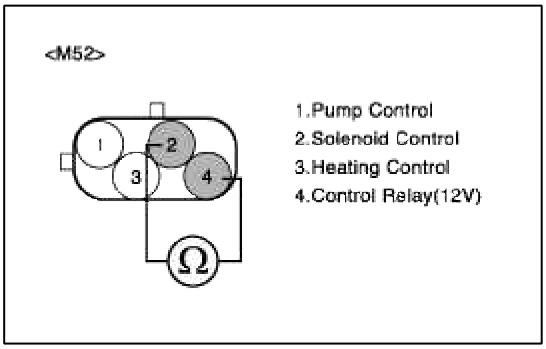
NO

Check for Open or short in Solenoid Control harness.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Solenoid
    (1) Ignition "OFF"
    (2) Disconnect DM-TL connector.
    (3) Measure resistance between terminal 2 and 4 of DM-TL harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

    (4) Is measure resistance within Specification?

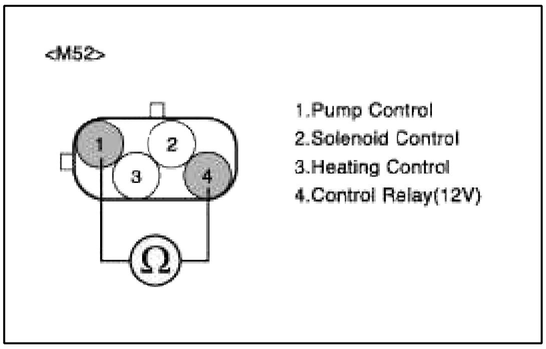
YES

Go to "Check Pump" as below.

NO

Substitute with a known-good Pump motor and check for proper operation. If the problem is corrected, replace Pump motor and then go to "Verification of Vehicle Repair" procedure.

2. Check Pump
    (1) Ignition "OFF"
    (2) Disconnect DM-TL connector.
    (3) Measure resistance between terminal 1 and 4 of DM-TL harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

    (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good DM-TL and check for proper operation. If the problem is corrected, replace DM-TL and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

YES

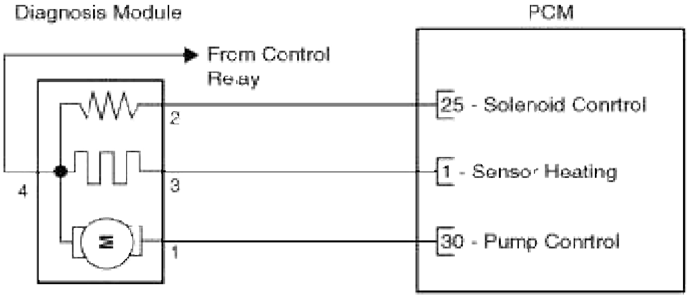
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

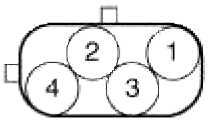
[CIRCUIT DIAGRAM]


Diagnosis Module
From Control
Relay
PCM
2
3
4
1
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

[HARNESS CONNECTORS]



Diagnosis Module

●	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
	3	★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	●	29	28	27	26	●
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Emission Control System > Troubleshooting > P2406

COMPONENT LOCATION

GENERAL DESCTIPTION

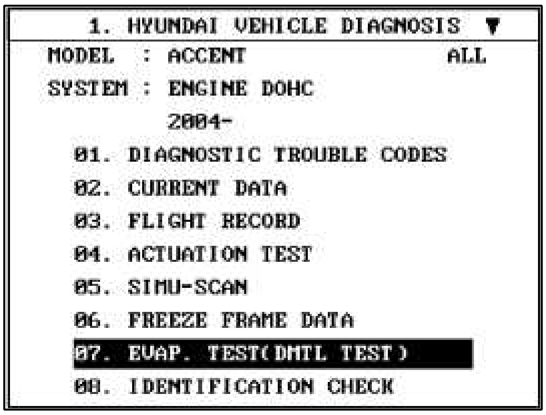
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● DM-TL : pump motor current	● Leakage on EVAP. SYSTEM ● Faulty DMTL. ● Faulty PCM
Threshold value	● Current at reference mode phase > 40 mA	
Enable Conditions		
Diagnostic Time	● 10 sec	
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Evap. Leakage Test
   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
     1. HYUNDAI VEHICLE DIAGNOSIS  ▼
  MODEL  : ACCENT              ALL
  SYSTEM : ENGINE DOHC
           2004-
    01. DIAGNOSTIC TROUBLE CODES
    02. CURRENT DATA
    03. FLIGHT RECORD
    04. ACTUATION TEST
    05. SIMU-SCAN
    06. FREEZE FRAME DATA
    07. EVAP. TEST(DMTL TEST)
    08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P2406 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

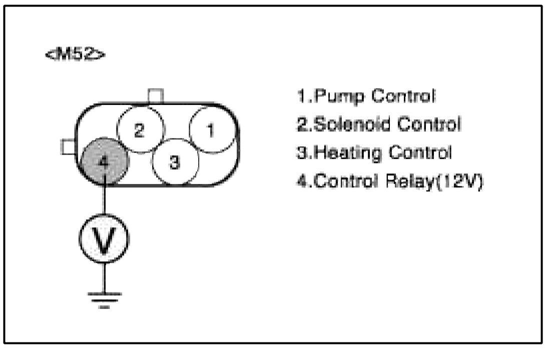
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit insepction" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of DM-TL harness connector and chassis ground.


<M52>
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)
1
2
3
4
V

5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

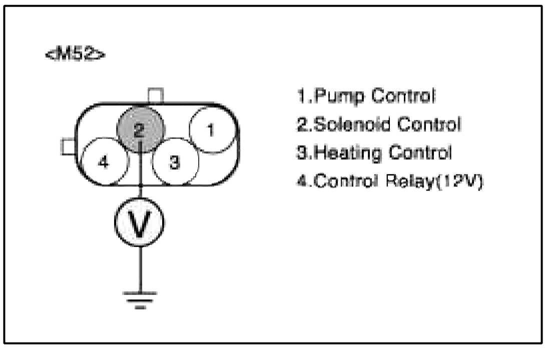
NO

Check for open or short circuit between Main relay and terminal 3 of DM-TL

Especially check "10A ECU" fuse is blown or not installed Repair as necessary and go to "Verification Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of DM-TL harness connector and chassis ground.


<M52>
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)
1
2
3
4
V

5. Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

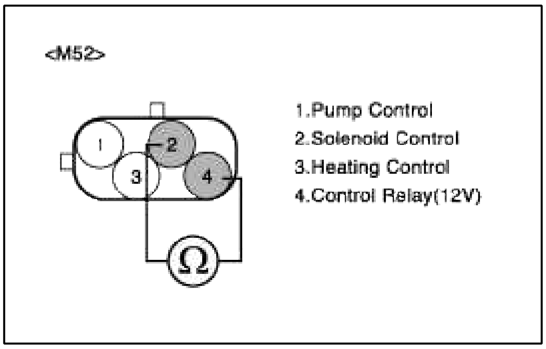
NO

Check for Open or short in Solenoid Control harness.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Solenoid
   (1) Ignition "OFF"
   (2) Disconnect DM-TL connector.
   (3) Measure resistance between terminal 2 and 4 of DM-TL harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (4) Is measure resistance within Specification?

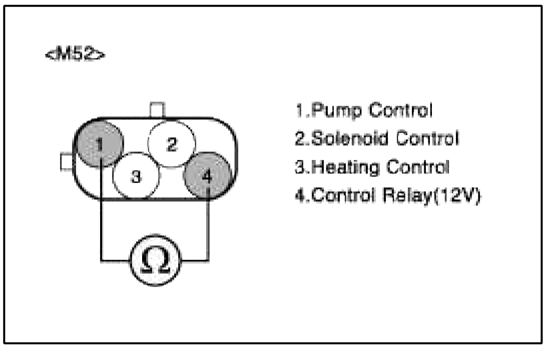
YES

Go to "Check Pump" as below.

NO

Substitute with a known-good DM-TL and check for proper operation. If the problem is corrected, replace DM-TL and then go to "Verification of Vehicle Repair" procedure..

2. Check Pump
   (1) Ignition "OFF"
   (2) Disconnect DM-TL connector.
   (3) Measure resistance between terminal 1 and 4 of DM-TL harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good DM-TL and check for proper operation. If the problem is corrected, replace DM-TL and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

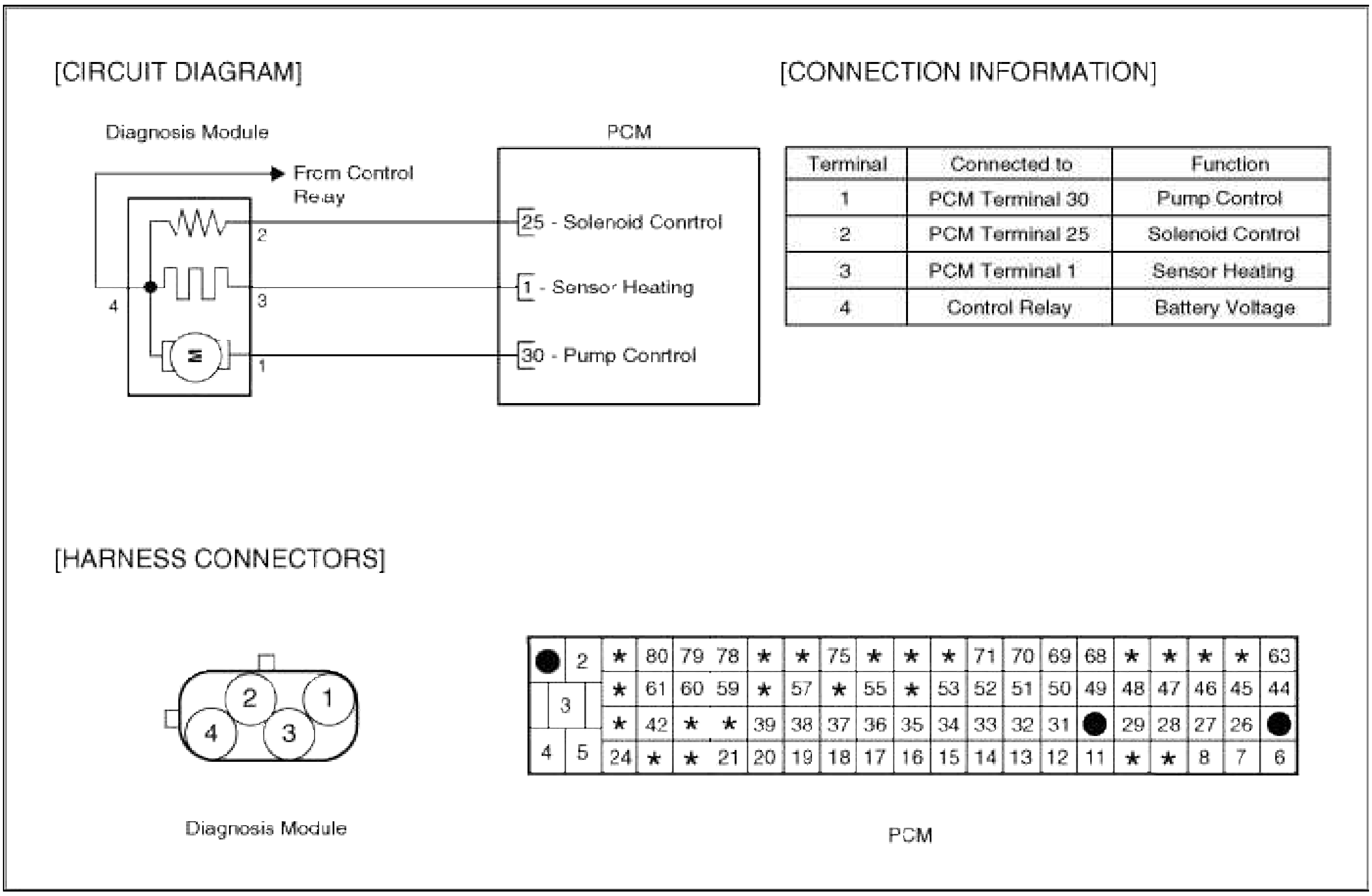
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
Diagnosis Module
From Control Relay
2
3
4
1
PCM
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol
[HARNESS CONNECTORS]
2
1
4
3
Diagnosis Module
PCM

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

●	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	●	29	28	27	26	●
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Emission Control System > Troubleshooting > P2407

COMPONENT LOCATION

GENERAL DESCTIPTION

DTC DESCRIPTION

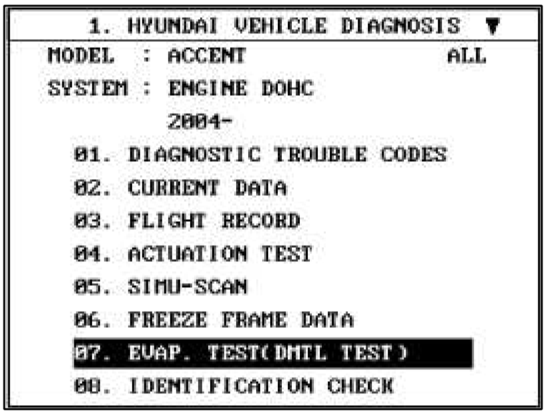
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● DM-TL : pump motor current	● Leakage on EVAP. SYSTEM ● Faulty DMTL ● Faulty PCM
Threshold value	● Number of not ended leak detection due to current change > 8	
Enable Conditions		
Diagnostic Time		
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Evap. Leakage Test

   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
     1. HYUNDAI VEHICLE DIAGNOSIS ▼
  MODEL  : ACCENT            ALL
  SYSTEM : ENGINE DOHC
           2004-
    01. DIAGNOSTIC TROUBLE CODES
    02. CURRENT DATA
    03. FLIGHT RECORD
    04. ACTUATION TEST
    05. SIMU-SCAN
    06. FREEZE FRAME DATA
    07. EVAP. TEST(DMTL TEST)
    08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P2407 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

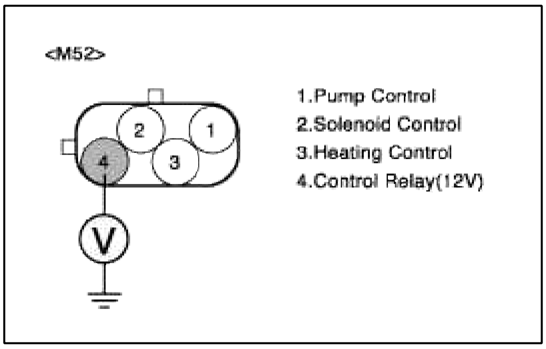
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit insepction" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of DM-TL harness connector and chassis ground.


<M52>
1
2
3
4
V
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

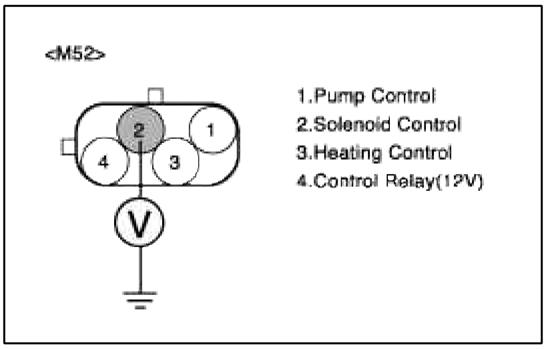
NO

Check for open or short circuit between Main relay and terminal 3 of DM-TL

Especially check "10A ECU" fuse is blown or not installed Repair as necessary and go to "Verification Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of DM-TL harness connector and chassis ground.


<M52>
2
1
4
3
V
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

5. Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

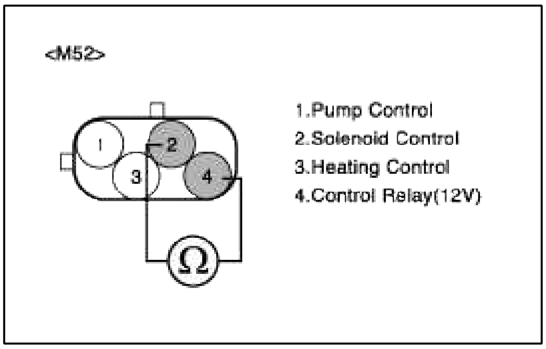
NO

Check for Open or short in Solenoid Control harness.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Solenoid
   (1) Ignition "OFF"
   (2) Disconnect DM-TL connector.
   (3) Measure resistance between terminal 2 and 4 of DM-TL harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (4) Is measure resistance within Specification?

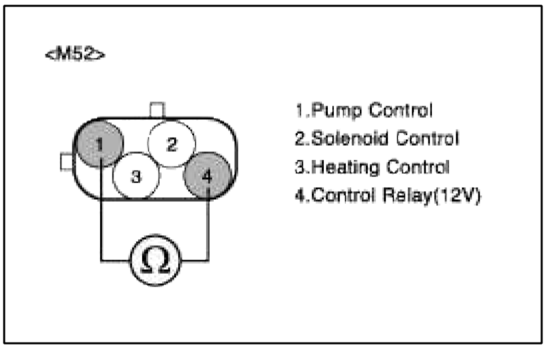
YES

Go to "Check Pump" as below.

NO

Substitute with a known-good DM-TL and check for proper operation. If the problem is corrected,replace DM-TL and then go to "Verification of Vehicle Repair" procedure .

2. Check Pump
   (1) Ignition "OFF"
   (2) Disconnect DM-TL connector.
   (3) Measure resistance between terminal 1 and 4 of DM-TL harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good DM-TL and check for proper operation. If the problem is corrected, replace DM-TL and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

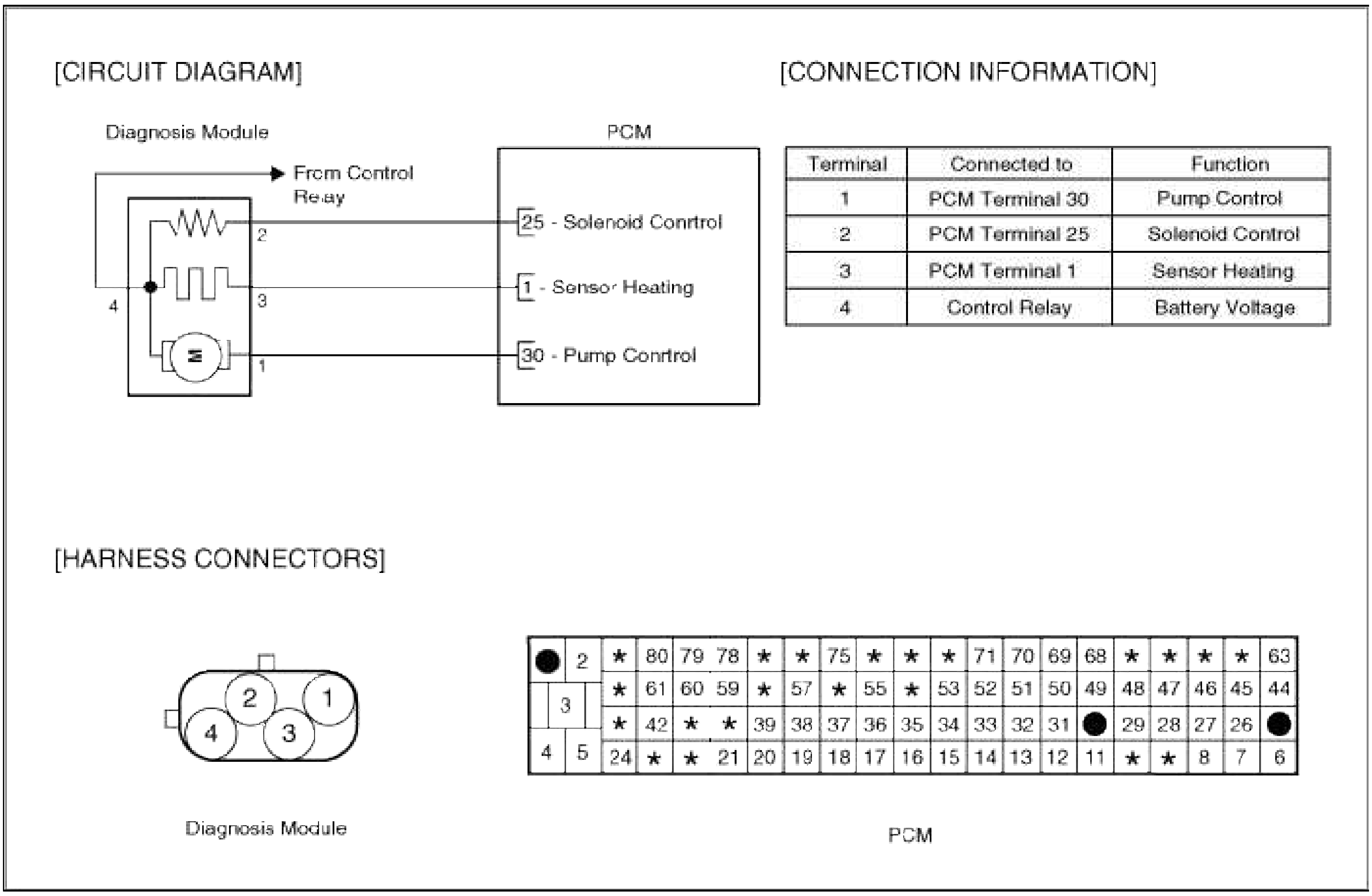
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
Diagnosis Module
From Control Relay
2
3
4
1
PCM
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol
[HARNESS CONNECTORS]
2
1
4
3
Diagnosis Module
PCM

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

●	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	●	29	28	27	26	●
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Emission Control System > Troubleshooting > P2418

COMPONENT LOCATION

GENERAL DESCTIPTION

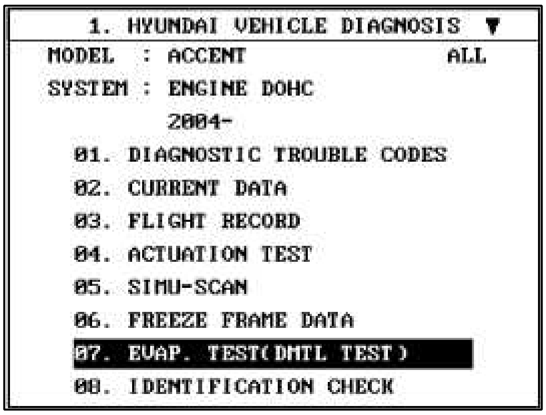
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check (Change-over valve)	● Open in control circuit ● Faulty DMTL ● Faulty PCM
Threshold value	● Disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Evap. Leakage Test
   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
     1. HYUNDAI VEHICLE DIAGNOSIS  ▼
  MODEL  : ACCENT             ALL
  SYSTEM : ENGINE DOHC
           2004-
    01. DIAGNOSTIC TROUBLE CODES
    02. CURRENT DATA
    03. FLIGHT RECORD
    04. ACTUATION TEST
    05. SIMU-SCAN
    06. FREEZE FRAME DATA
    07. EVAP. TEST(DMTL TEST)
    08. IDENTIFICATION CHECK
```

   (1) Connect scantool to Data Link Connector(DLC).

   (2) Warm up the engine to normal operating temperature.

   (3) Perform "07 EVAP. LEAKAGE TEST" mode

   (4) Is DTC P2418 set again?

   YES

   Go to "W/Harness Inspection" procedure.

   NO

   Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

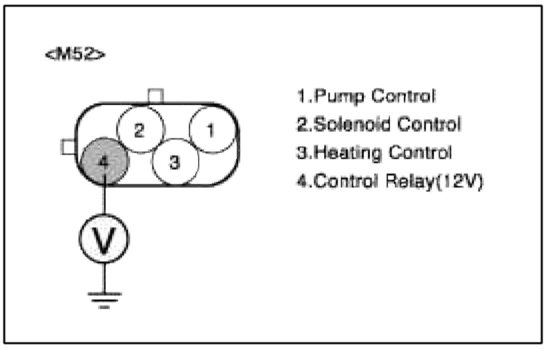
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit insepction" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of DM-TL harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

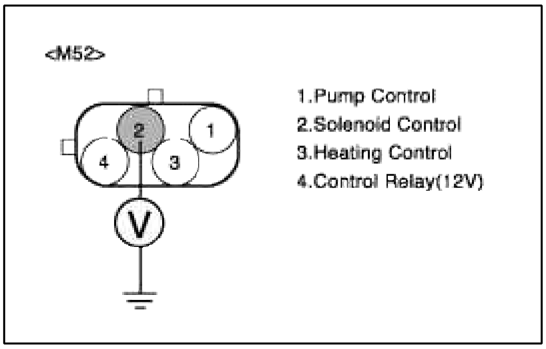
Short circuit to chassis ground between DM-TL harness connector and control relay.
Open circuit between DM-TL harness connector and control relay.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

1. In case,when DM-TL connector is disconnected, the voltage of DM-TL terminal 4 is 0V.
   Possible cause: Open or short circuit in battery power line after fuse (10A ECU #1).
2. PCM also sets P0444 and P0562 if it detects the open circuit in DM-TL power line.

CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect DM-TL connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of DM-TL harness connector and chassis ground.


<M52>
2
1
4
3
V
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

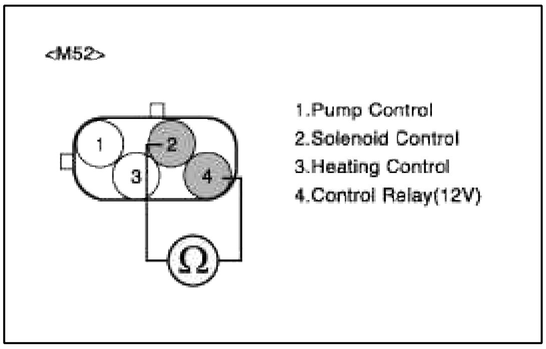
Short circuit to chassis ground between DM-TL harness connector and ECM harness connector
Open circuit between DM-TL harness connector and PCM harness connector
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when the DM-TL connector is disconnected,the voltage of DM-TL terminal 1 is 0 V.
Possible cause: Open or short between terminal 25 of PCM and terminal 2 of DM-TL.

COMPONENT INSPECTION

1. Check for short between Solenoid Control and battery
   (1) Ignition "OFF"
   (2) Disconnect Fuel sender connector.
   (3) Measure resistance between terminal 2 and 4 of Fuel sender harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

(4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Pump motor and check for proper operation. If the problem is corrected, replace Pump motor and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

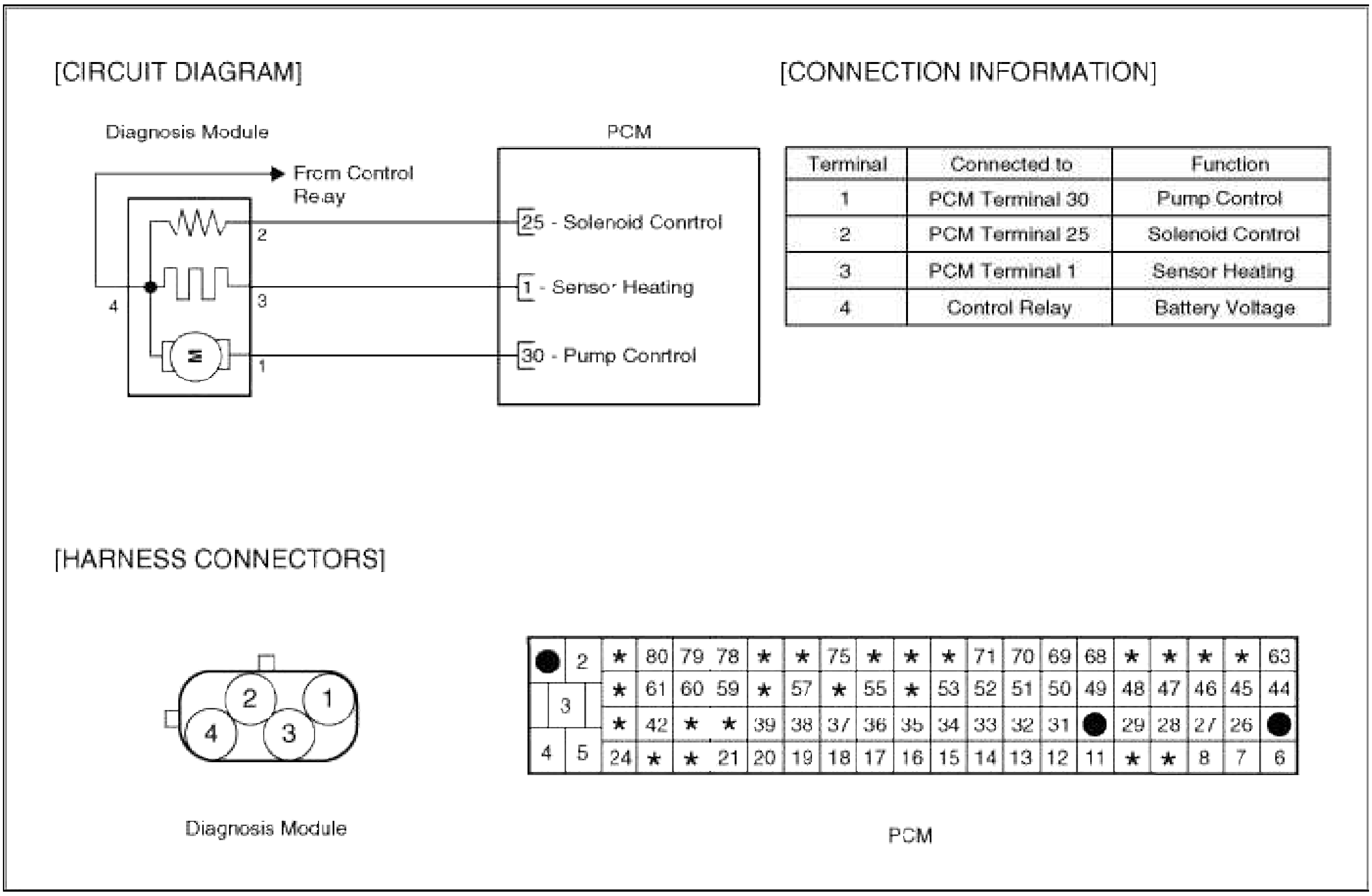
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
Diagnosis Module
From Control Relay
2
3
1
4
PCM
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
2
1
4
3
Diagnosis Module
PCM

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

●	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	●	29	28	27	26	●
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Emission Control System > Troubleshooting > P2419

COMPONENT LOCATION

GENERAL DESCTIPTION

DTC DESCRIPTION

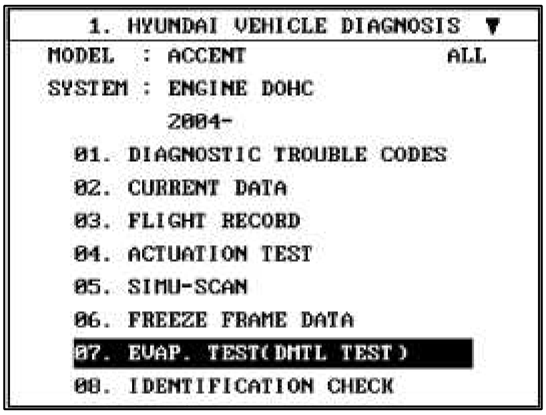
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check (Change-over valve)	● Open in control circuit ● Faulty DMTL ● Faulty PCM
Threshold value	● Disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Evap. Leakage Test

   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
      1. HYUNDAI VEHICLE DIAGNOSIS  ▼
  MODEL  : ACCENT             ALL
  SYSTEM : ENGINE DOHC
           2004-
    01. DIAGNOSTIC TROUBLE CODES
    02. CURRENT DATA
    03. FLIGHT RECORD
    04. ACTUATION TEST
    05. SIMU-SCAN
    06. FREEZE FRAME DATA
    07. EVAP. TEST(DMTL TEST)
    08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P2418 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

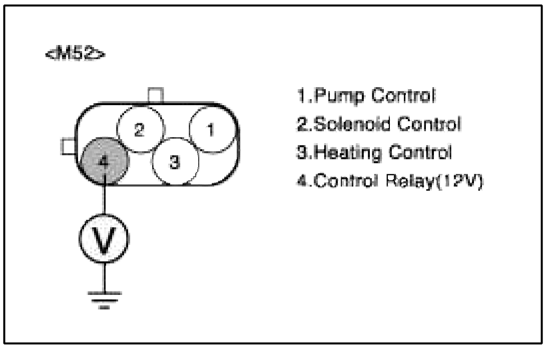
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit insepction" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect DM-TL connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of DM-TL harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

Short circuit to chassis ground between DM-TL harness connector and control relay.
Open circuit between DM-TL harness connector and control relay.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

1. In case,when DM-TL connector is disconnected, the voltage of DM-TL terminal 4 is 0V.
   Possible cause: Open or short circuit in battery power line after fuse (10A ECU #1).
2. PCM also sets P0444 and P0562 if it detects the open circuit in DM-TL power line.

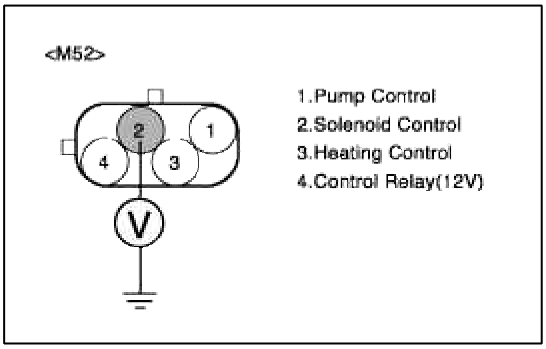
CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"

   (2) Disconnect DM-TL connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 2 of DM-TL harness connector and chassis ground.


<M52>
1
2
3
4
V
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit to chassis ground between DM-TL harness connector and ECM harness connector
Open circuit between DM-TL harness connector and PCM harness connector
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

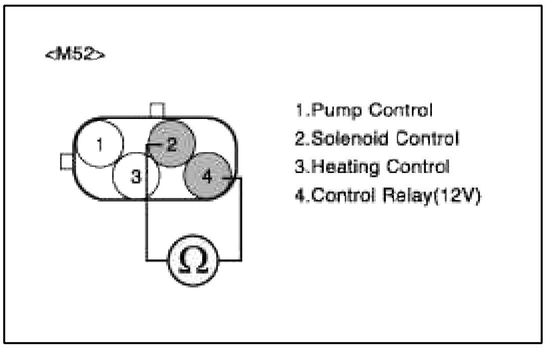
> **NOTE**
>
> In case,when the DM-TL connector is disconnected,the voltage of DM-TL terminal 1 is 0 V.
>
> Possible cause: Open or short between terminal 25 of PCM and terminal 2 of DM-TL.

COMPONENT INSPECTION

1. Check for short between Solenoid Control and battery
   (1) Ignition "OFF"

   (2) Disconnect Fuel sender connector.

   (3) Measure resistance between terminal 2 and 4 of Fuel sender harness connector.(To sender side)


<M52>
1
2
3
4
Ω
1.Pump Control
2.Solenoid Control
3.Heating Control
4.Control Relay(12V)

(4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Pump motor and check for proper operation. If the problem is corrected, replace Pump motor and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

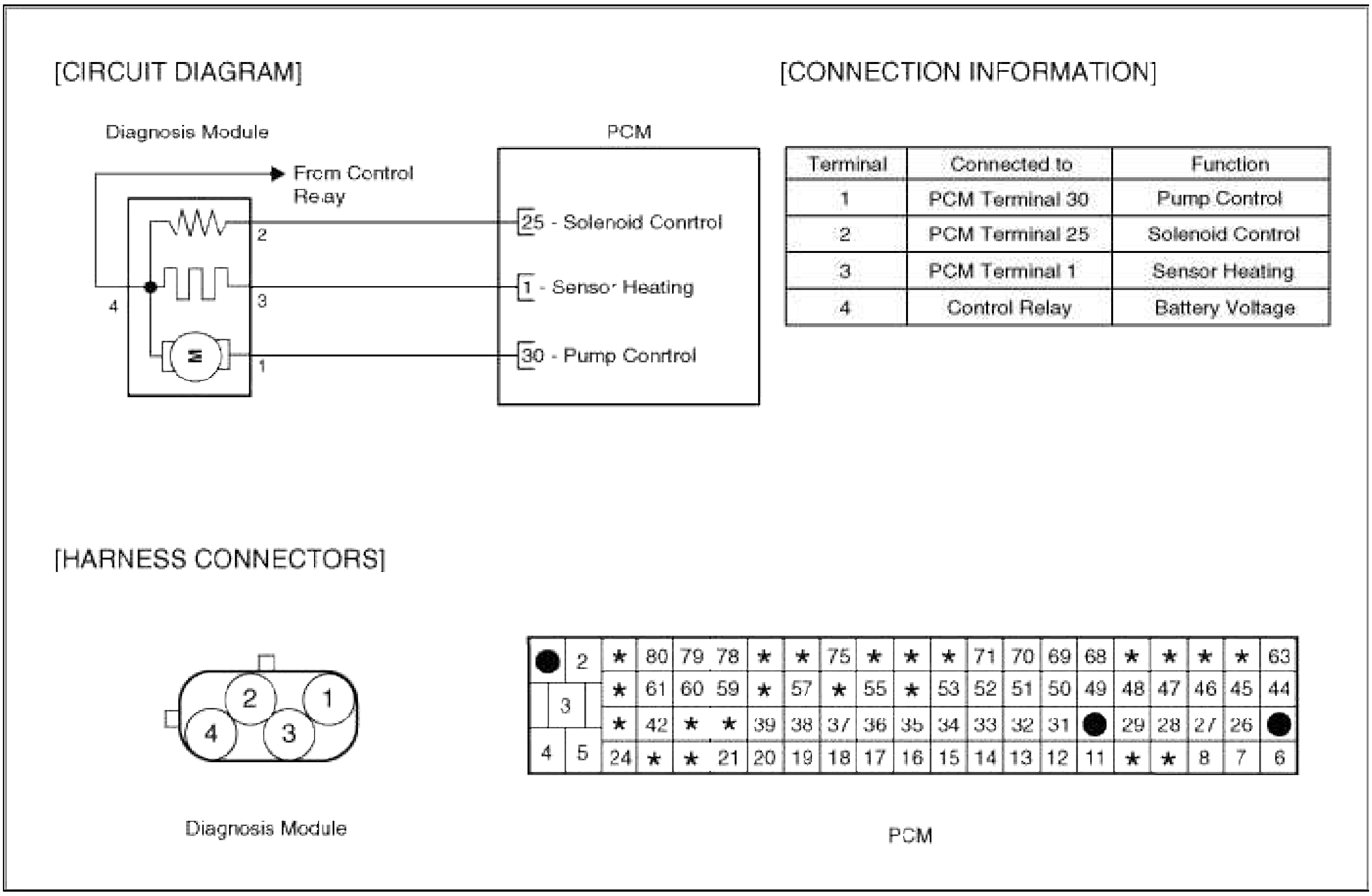
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
Diagnosis Module
From Control Relay
PCM
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol
2
3
1
4
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
2
1
4
3
Diagnosis Module
PCM

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

●	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	●	29	28	27	26	●
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Emission Control System > Troubleshooting > P2420

COMPONENT LOCATION

GENERAL DESCTIPTION

DTC DESCRIPTION

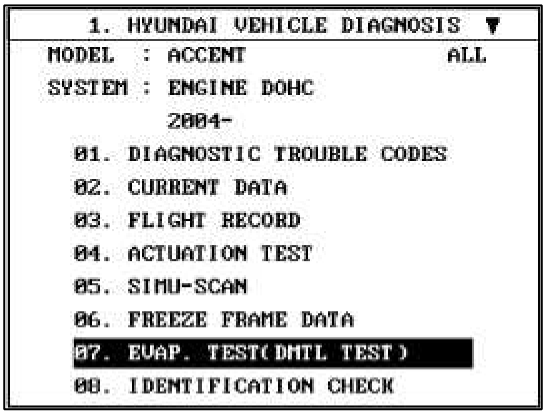
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check (Change-over valve)	● Short to battery in control circuit ● Faulty DMTL ● Faulty PCM
Threshold value	● Shorted to battery voltage	
Enable Conditions	● Shorted circuit	
Diagnostic Time	● Continuous	
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Evap. Leakage Test

   Evaporative Emissions Systems (EVAP) Leak Tests can be run by the Scan Tool. The tests are automated and provide either a pass-fail result or directions to check for DTCs.



```
   1. HYUNDAI VEHICLE DIAGNOSIS  ▼
 MODEL  : ACCENT             ALL
 SYSTEM : ENGINE DOHC
          2004-
   01. DIAGNOSTIC TROUBLE CODES
   02. CURRENT DATA
   03. FLIGHT RECORD
   04. ACTUATION TEST
   05. SIMU-SCAN
   06. FREEZE FRAME DATA
   07. EVAP. TEST(DMTL TEST)
   08. IDENTIFICATION CHECK
```

(1) Connect scantool to Data Link Connector(DLC).

(2) Warm up the engine to normal operating temperature.

(3) Perform "07 EVAP. LEAKAGE TEST" mode

(4) Is DTC P2420 set again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection,bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and go to "Verification vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

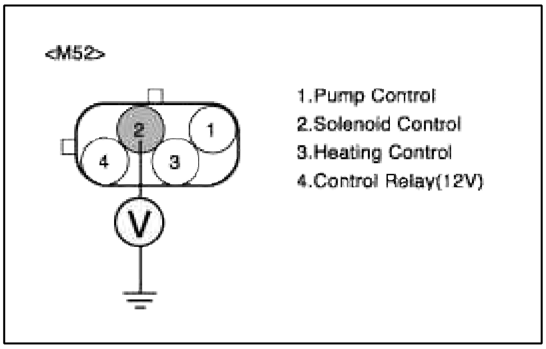
CONTROL CIRCUIT INSPECTION

1. Check for short between battery and Solenoid control harness
   (1) Ignition "OFF"

   (2) Disconnect DM-TL connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 2 of DM-TL harness connector and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

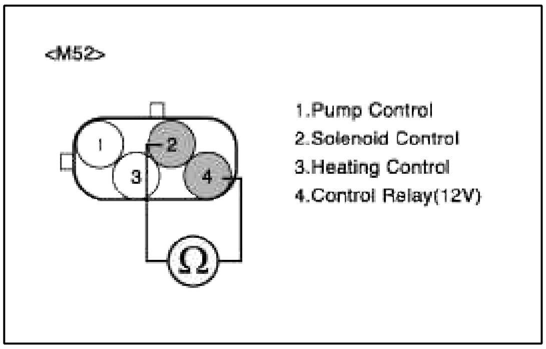
NO

Check for short to battery in Pump control harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the DM-TL connector is disconnected,the voltage of DM-TL terminal 4 is 12 V.
>
> Possible cause: Short circuit in battery power line after fuse. (10A ECU #1)

COMPONENT INSPECTION

1. Check for short between Solenoid Control and battery.
    (1) Ignition "OFF"
    (2) Disconnect DM-TL connector.
    (3) Measure resistance between terminal 2 and 4 of DM-TL harness connector.(To sender side)



    (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, eplace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Pump motor and check for proper operation. If the problem is corrected, replace Pump motor and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

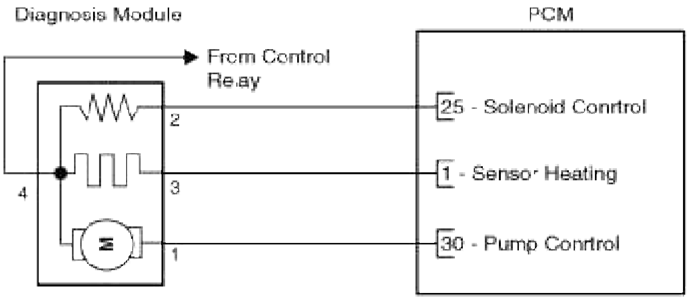
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

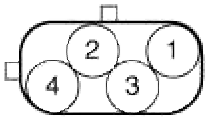
[CIRCUIT DIAGRAM]


Diagnosis Module
From Control Relay
PCM
2
3
4
1
M
25 - Solenoid Conrtrol
1 - Sensor Heating
30 - Pump Conrtrol

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 30	Pump Control
2	PCM Terminal 25	Solenoid Control
3	PCM Terminal 1	Sensor Heating
4	Control Relay	Battery Voltage

[HARNESS CONNECTORS]



Diagnosis Module

●	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
	3	★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	●	29	28	27	26	●
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

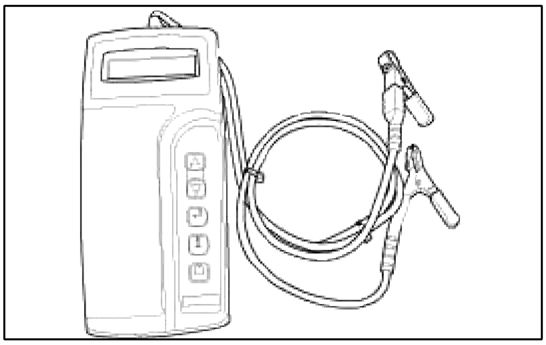
ACCENT(LC) > 2005 > G 1.5 SOHC > Engine Electrical System

Engine Electrical System > General Information > General Information

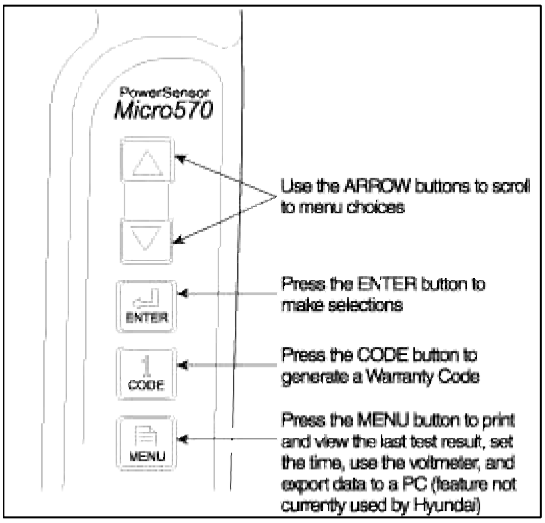
THE MICRO 570 ANALYZER

CAUTION

Because of the possibility of personal injury, always use extreme caution and appropriate eye protection when working with batteries.

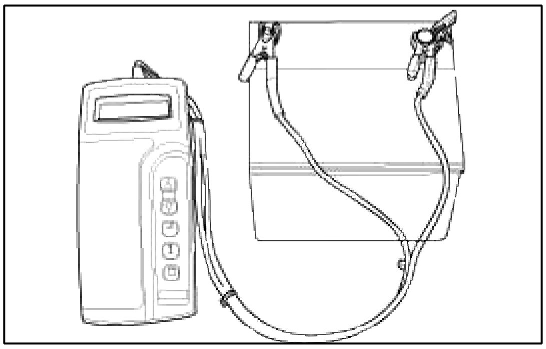


KEYPAD


PowerSensor
Micro570
Use the ARROW buttons to scroll to menu choices
ENTER
Press the ENTER button to make selections
1
CODE
Press the CODE button to generate a Warranty Code
MENU
Press the MENU button to print and view the last test result, set the time, use the voltmeter, and export data to a PC (feature not currently used by Hyundai)

BATTERY TEST PROCEDURE

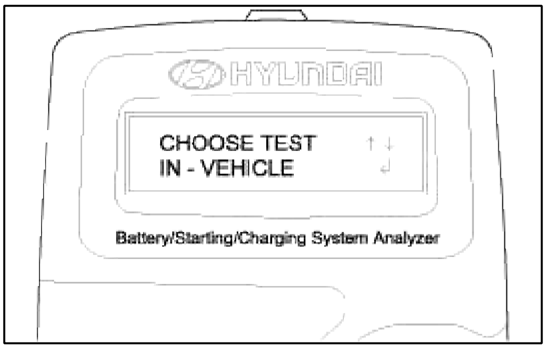
1. Connect the tester to the battery.
    A. Red clamp to battery positive (+) terminal.
    B. Black clamp to battery negative (-) terminal.



CAUTION

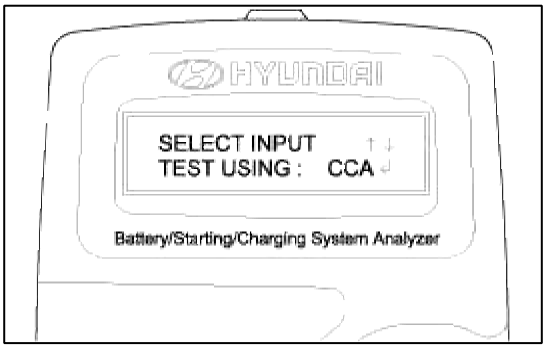
Connect clamps securely. If "CHECK CONNECTION" message is displyed on the screen, reconnect clamps securely.

2. The tester will ask if the battery is connected "IN A VEHICLE" or "OUT OF A VEHICLE". Make your selection by pressing the arrow buttons; then press ENTER.


HYUNDAI
Battery/Starting/Charging System Analyzer

CHOOSE TEST ↑↓
IN - VEHICLE ↲

3. Choose eigher CCA or CCP and press the ENTER button.

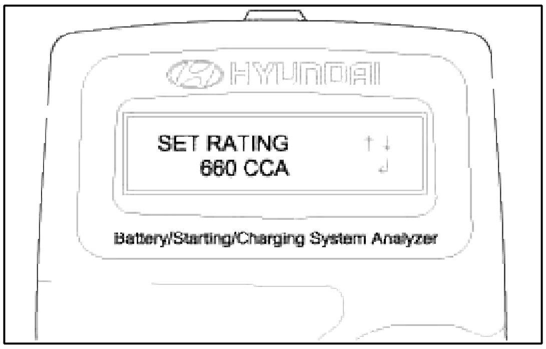

HYUNDAI
Battery/Starting/Charging System Analyzer

SELECT INPUT ↑↓
TEST USING : CCA ↲

NOTE

- CCA : Cold cranking amps, is an SAE specification for cranking batteried at 0°F (-18°C).
- CCP : Cold cranking amps, is an SAE specification for korean manufacturer's for cranking batteries at 0°F (-18°C)

4. Set the CCA value displyed on the screen to the CCA value marked on the battery label by pressing up and down buttons and press ENTER.

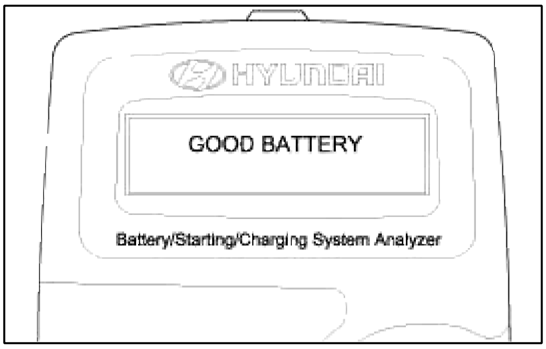

HYUNDAI
Battery/Starting/Charging System Analyzer

SET RATING ↑↓
660 CCA ↲

NOTE

The battery ratings(CCA) displyed on the tester must be identical to the ratings marked on battery label.

5. The tester (Micro570) displays battery test results including voltage and battery ratings.
   A relevant action must be given according to the test results by referring to the battery test results as shown in the table below.


HYUNDAI
GOOD BATTERY
Battery/Starting/Charging System Analyzer

6. To conduct starter test, continuously, press ENTER.
   BATTERY TEST RESULTS

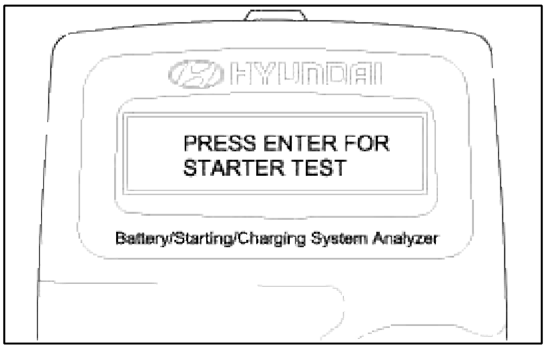
RESULT ON PRINTER	REMEDY
Good battery	No action is required
Good recharge	Battery is in a good state Recharge the battery and use
Charge & Retest	Battery is not charged properly → Charge and test the battery again (Failure to charge the battery fully may read incorrect measurement value)
Replace battery	→ Replace battery and recheck the charging system. (Improper connection between battery and vehicle cables may cause "REPLACE BATTERY", retest the battery after removing cables and connecting the tester to the battery terminal directly prior to replacing the battery)
Bad cell-replace	→ Charge and retest the battery. And than, test results may cause "REPLACE BATTERY", replace battery and recheck the charging system

WARNING

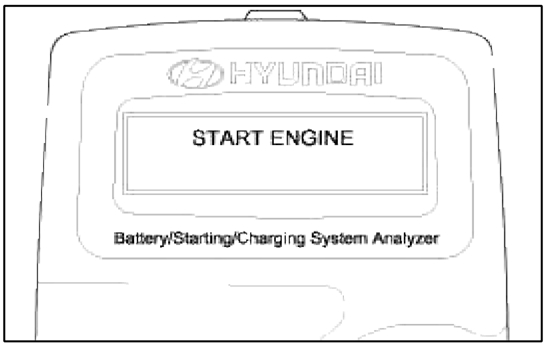
Whenever filing a claim for battery, the print out of the battery test results must be attached.

STARTER TEST PROCEDURE

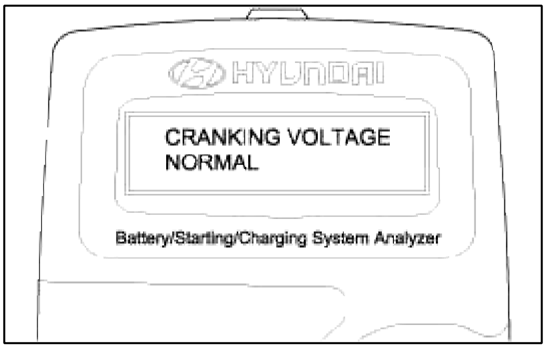
1. After the battery test, press ENTER immediately for the starter test.


HYUNDAI
PRESS ENTER FOR
STARTER TEST
Battery/Starting/Charging System Analyzer

2. After pressing ENTER key, start the engine.


HYUNDAI
START ENGINE
Battery/Starting/Charging System Analyzer

3. Cranking voltage and starter test results will be displayed on the screen.
   Take a relevant action according to the test results by referring to the starter test results as given below.


HYUNDAI
CRANKING VOLTAGE NORMAL
Battery/Starting/Charging System Analyzer

4. To continue charging system test, press ENTER.

STARTER TEST RESULTS

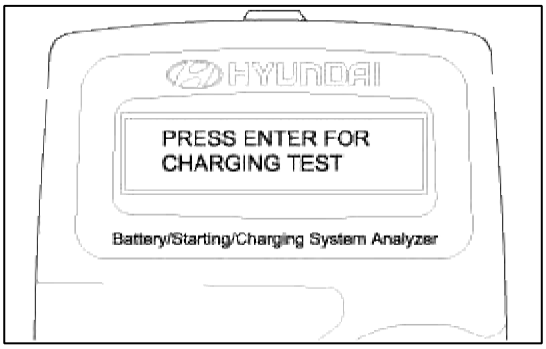
RESULT ON PRINTER	REMEDY
Cranking voltage normal	System shows a normal starter draw
Cranking voltage low	Cranking voltage is lower than normal level → Check starter
Charge battery	The state of battery charge is too low to test → Charge the battery and retest
Replace battery	→ Replace battery If the vehicle is not started though the battery condition of "Good and fully charged" is displayed. → Check wiring for open circuit, battery cable connection, starter and repair or replace as necessary. → If the engine does crank, check fuel system.

NOTE

When testing the vehicle with old diesel engines, the test result will not be favorable if the glow plug is not heated. Conduct the test after warming up the engine for 5 minutes.

CHARGING SYSTEM TEST PROCEDURE

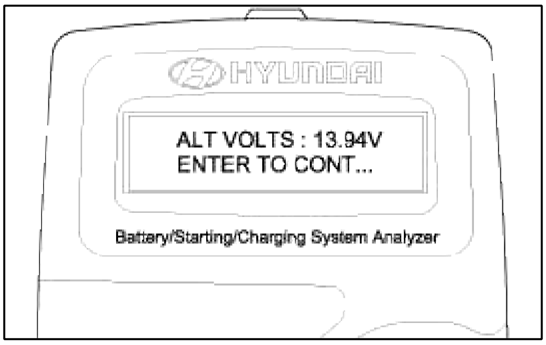
1. Press ENTER to begin charging system test.



```
PRESS ENTER FOR
CHARGING TEST
```

HYUNDAI
Battery/Starting/Charging System Analyzer

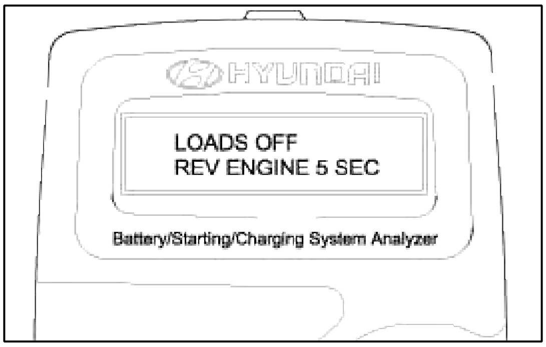
2. If ENTER button is pressed, the tester displays the actual voltage of alternator.
   Press ENTER to test the charging system.



```
ALT VOLTS : 13.94V
ENTER TO CONT...
```

HYUNDAI
Battery/Starting/Charging System Analyzer

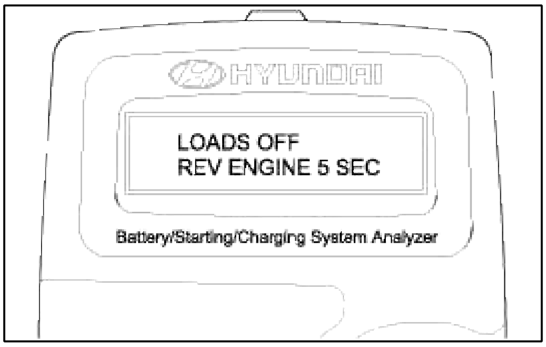
3. Turn off all electrical load and rev engine for 5 seconds with pressing the accelerator pedal.



```
LOADS OFF
REV ENGINE 5 SEC
```

HYUNDAI
Battery/Starting/Charging System Analyzer

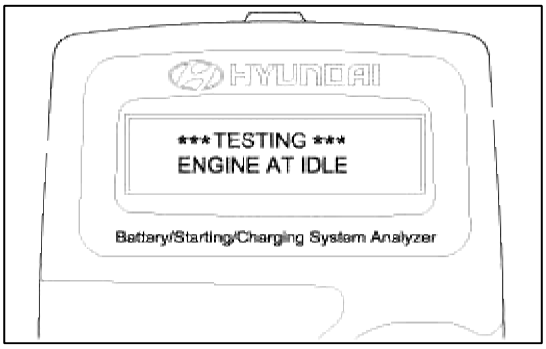
4. Press ENTER.



```
LOADS OFF
REV ENGINE 5 SEC
```

HYUNDAI
Battery/Starting/Charging System Analyzer

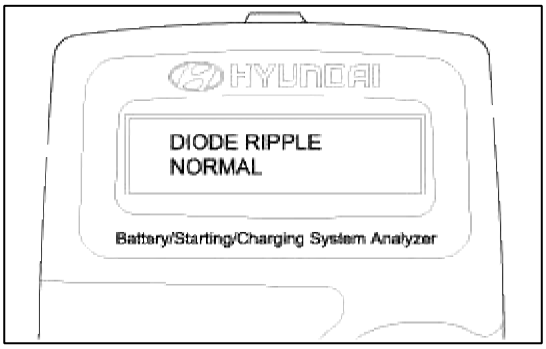
5. The MICRO 570 analyzer charging system output at idle for comparision to other readings.



```
*** TESTING ***
ENGINE AT IDLE
```

HYUNDAI
Battery/Starting/Charging System Analyzer

6. Take a relevant action according to the test results by referring to the table below after shutting off the engine and disconnect the tester clamps from the battery.



CHARGING SYSTEM TEST RESULTS

RESULT ON PRINTER	REMEDY
Charging system normal/Diode ripple normal	Charging system is normal
No charging voltage	Alternator does not supply charging current to battery → Check belts, connection between alternator and battery Replace belts or cable or alternator as necessary
Low charging voltage	Alternator does not supply charging current to battery and electrical load to system fully → Check belts and alternator and replace as necessary
High charging voltage	The voltage from alternator to battery is higher than normal limit during voltage regulating. → Check connection and ground and replace regulator as necessary → Check electrolyte level in the battery
Excess ripple detected	One or more diodes in the alternator is not functioning properly → Check alternator mounting and belts and replace as necessary

Engine Electrical System > General Information > Troubleshooting

TROUBLESHOOTING

IGNITION SYSTEM

Symptom	Suspect Area	Remedy (See Page)
Engine will not start or is hard to start (Cranks OK)	Ignition lock switch Ignition coil Spark plugs Ignition wiring disconnected or broken Spark plug cable	See page EE-14 See page EE-13 See page EE-12 Repair See page EE-12
Rough idle or stalls	Ignition wiring Ignition coil Spark plug cable	Inspect See page EE-13 See page EE-12
Engine hesitates/poor acceleration	Spark plugs and spark plug cable Ignition wiring	See page EE-12 Inspect
Poor mileage	Spark plugs and spark plugs cable	See page EE-12

CHARGING SYSTEM

Symptom	Suspect Area	Remedy (See Page)
Charging warning indicator does not light with ignition switch "ON" and engine off	Fuse blown Light burned out Wiring connection loose Electronic voltage regulator	Check fuses Replace light Tighten loose connections See page EE-19
Charging warning indicator does not go out with engine running (Battery requires frequent recharging)	Drive belt loose or worn Battery cables loose, corroded or worn Fuse blown Fusible link blown Electronic voltage regulator or generator Wiring	See page EE-27 Repair Check fuses Replace fusible link See page EE-19 Repair wiring
Engine hesitates/poor acceleration Overcharge	Drive belt loose or worn Wiring connection loose or open circuit Fusible link blown Poor grounding Electronic voltage regulator or generator Worn battery Electronic voltage regulator Voltage sensing wire	See page EE-27 Tighten loose connection or repair wiring Replace fusible link Repair See page EE-19 Replace battery See page EE-19 Repair wire

STARTING SYSTEM

Symptom	Suspect Area	Remedy (See Page)
Engine will not crank	Battery charge low Battery cables loose, corroded or worn out Transaxle range switch (Vehicle with automatic transaxle only) Fusible link blown Starter motor Ignition switch	Charge or replace battery Repair or replace cables See page TR group-automatic transaxle Replace fusible link See page EE-37 See page EE-14
Engine cranks slowly	Battery charge low Battery cables loose, corroded or worn out Starter motor	Charge or replace battery Repair or replace cables See page EE-37
Starter keeps running	Starter motor Ignition switch	See page EE-37 See page EE-14
Starter spins but engine will not crank	Short in wiring Pinion gear teeth broken or starter motor Ring gear teeth broken	Repair wiring See page EE-37 See page EM group-fly wheel

Engine Electrical System > General Information > Specifications

SPECIFICATION

IGNITION SYSTEM

Items	Specifications
Ignition coil	
Type	Mold coil type
Primary resistance	0.87 ± 10% (Ω)
Secondary resistance	13.0 ± 15% (kΩ)
Spark plugs	
NGK	BKR5ES-11
CHAMPION	RC10TC4
Gap	1.0 ~ 1.1 mm

STARTING SYSTEM

Items	Specifications
Starter	
Type	Direct drive type
Rated voltage	12V, 0.9KW
No. of pinion teeth	8
No-load characteristics	
Voltage	11.5V
Amperage	60A, Max.
Speed	5,500 rpm, Min.
Commutator diameter	
Standard	29.4 mm (1.157 in.)
Limit	28.4 mm (1.118 in.)
Undercut depth	
Standard	0.5 mm (0.02 in.)
Limit	0.2 mm (0.008 in.)

CHARGING SYSTEM

Items	Specifications
Alternator	
Type	Battery voltage sensing
Rated voltage	13.5V, 90A
Speed in use	1000 ~ 18,000 rpm
Voltage regulator	Electronic built-in type
Regulator setting voltage	14.55 ± 0.2V
Temperature compensation	-10 ± 3 mV/°C
Battery	
Type	MF55AH
Cold cranking amperage [at -18°C (0°F)]	500A
Reserve capacity	85min
Specific gravity [at 25°C (77°F)]	1,280 ± 0.01

NOTE

- COLD CRANKING AMPERAGE is the amperage a battery can deliver for 30 seconds and maintain a terminal voltage of 7.2 or greater at a specified temperature.
- REVERSE CAPACITY RATING is amount of time a battery can deliver 25A and maintain a minimum terminal voltage of 10.5 at 26.7°C(80°F)

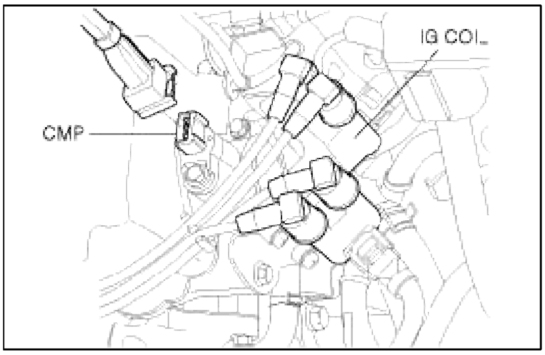
TIGHTENING TORQUE

Items	Nm	kg·cm	lb·ft
Generator terminal (B+)	5 ~ 7	50 ~ 70	3.6 ~ 5.1
Starter motor terminal (B+)	10 ~ 12	100 ~ 120	7.3 ~ 8.8
Battery terminal	4 ~ 6	40 ~ 60	2.9 ~ 4.3
Spark plug	20 ~ 30	200 ~ 300	15 ~ 22

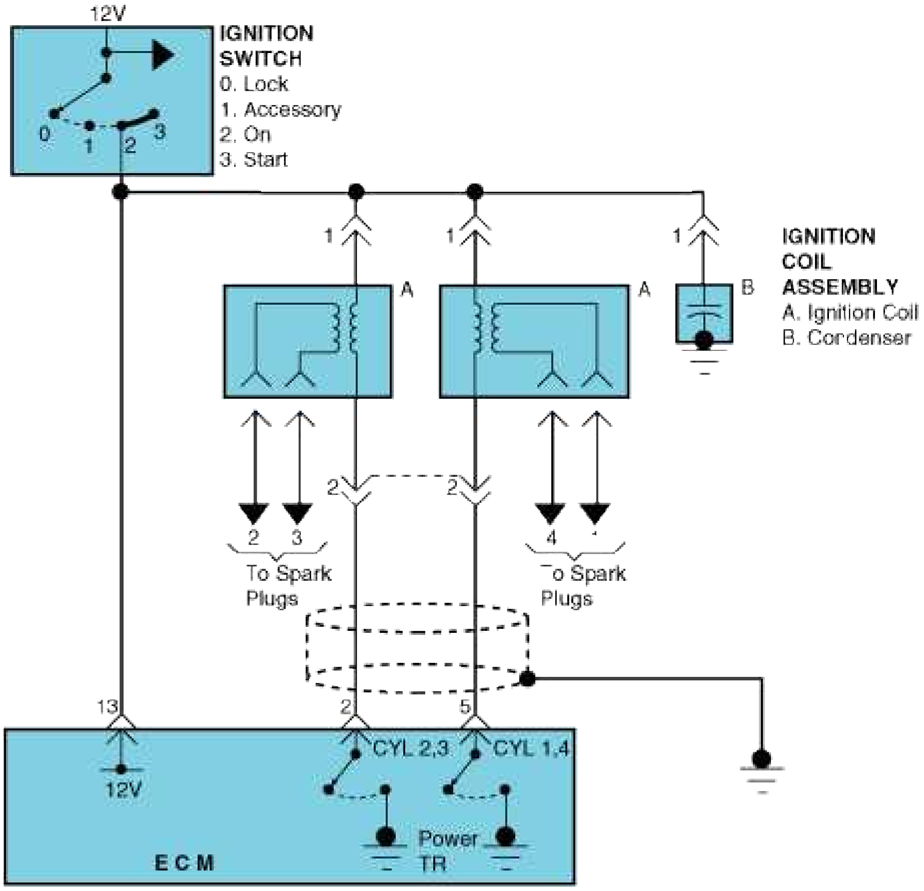
Engine Electrical System > Ignition System > Ignition Coil > Troubleshooting

IGNITION COIL

When the ignition power transistor is turned ON by a signal from the ECM, the ECM sends a signal to the ignition coil, then the primary current is shut off and a high voltage is induced in the secondary coil.

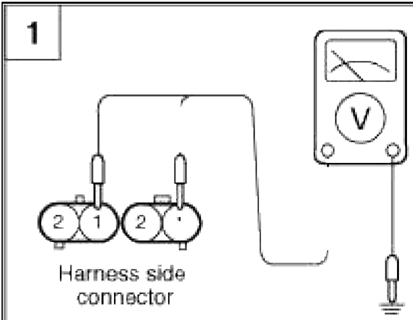
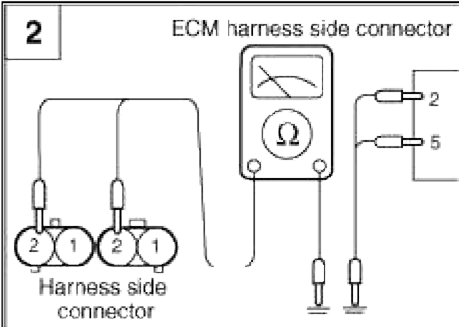


CIRCUIT DIAGRAM


12V
IGNITION SWITCH
0. Lock
1. Accessory
2. On
3. Start
0
1
2
3
1
1
1
IGNITION COIL ASSEMBLY
A. Ignition Coil
B. Condenser
A
A
B
2
2
2
3
To Spark Plugs
4
To Spark Plugs
13
2
5
12V
CYL 2,3
CYL 1,4
Power TR
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURES

1	 V 2 1 2 Harness side connector	Measure the power supply voltage of the ignition coil. • Connector : Disconnected • Ignition switch : ON • Voltage (V) : Battery voltage	**OK** ⇨	2
			NG ⇨	Repair the harness.
2	 ECM harness side connector Ω 2 5 2 1 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the ignition coil and the engine control module. • Engine control module connector: Disconnected • Power transistor connector: Disconnected	**OK** ⇨	**END!**
			NG ⇨	Repair the harness.

Engine Electrical System > Ignition System > Description and Operation

DESCRIPTION

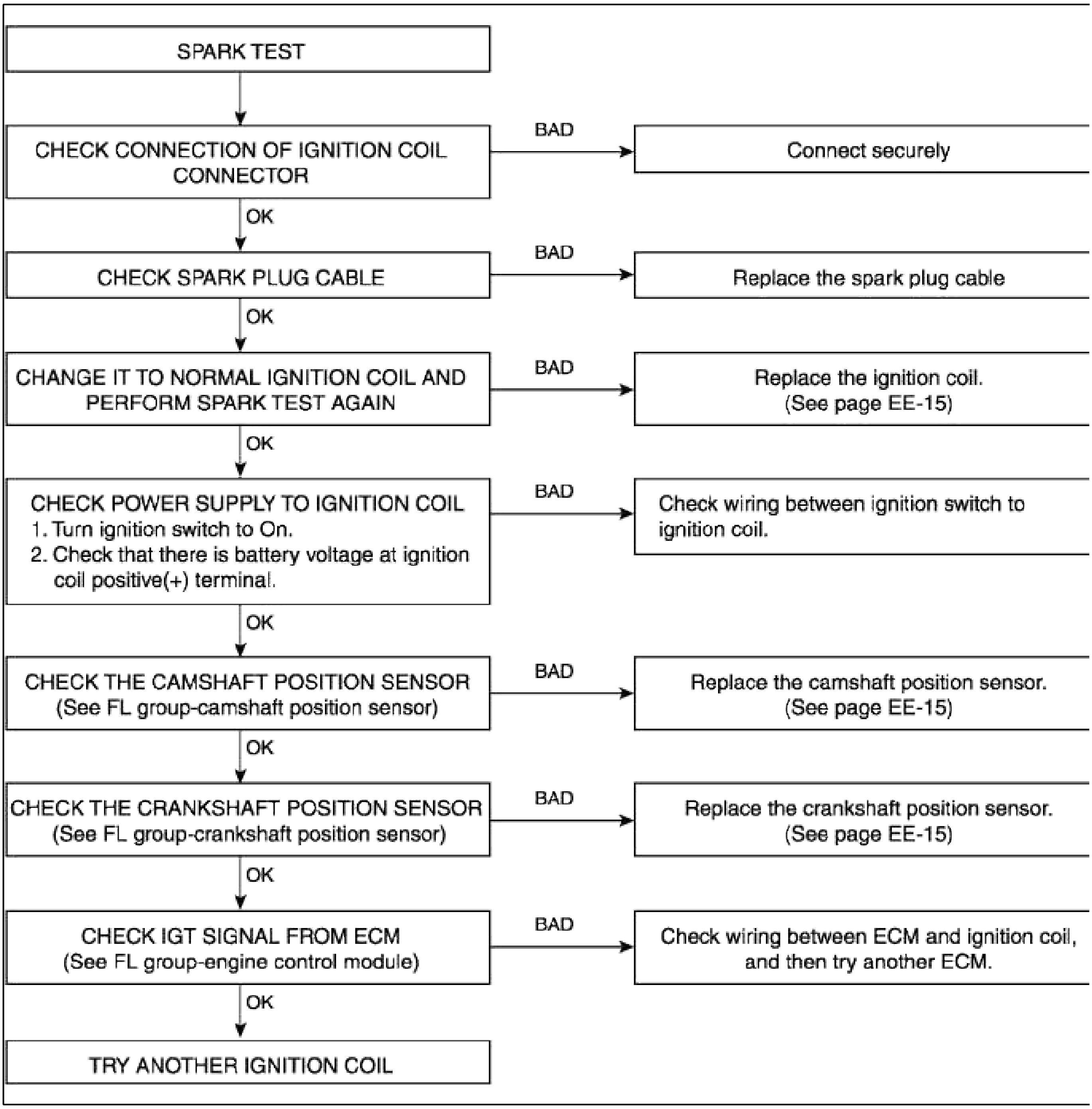
Engine Electrical System > Ignition System > Repair procedures

ON-VEHICLE INSPECTION

INSPECT SPARK TEST

1. Remove the spark plug cable.
2. Using a spark plug socket, remove the spark plug.
3. Remove the ignition coil.
4. Install the spark plugs to each spark plug cable.
5. Ground the spark plugs.
6. Check is spark occurs while engine is being cranked.

> **NOTE**
>
> To prevent gasoline from being injected from injectors during this test, crank the engine for no more then 5~10 seconds at time.


SPARK TEST
CHECK CONNECTION OF IGNITION COIL CONNECTOR
BAD
Connect securely
OK
CHECK SPARK PLUG CABLE
BAD
Replace the spark plug cable
OK
CHANGE IT TO NORMAL IGNITION COIL AND PERFORM SPARK TEST AGAIN
BAD
Replace the ignition coil. (See page EE-15)
OK
CHECK POWER SUPPLY TO IGNITION COIL
1. Turn ignition switch to On.
2. Check that there is battery voltage at ignition coil positive(+) terminal.
BAD
Check wiring between ignition switch to ignition coil.
OK
CHECK THE CAMSHAFT POSITION SENSOR (See FL group-camshaft position sensor)
BAD
Replace the camshaft position sensor. (See page EE-15)
OK
CHECK THE CRANKSHAFT POSITION SENSOR (See FL group-crankshaft position sensor)
BAD
Replace the crankshaft position sensor. (See page EE-15)
OK
CHECK IGT SIGNAL FROM ECM (See FL group-engine control module)
BAD
Check wiring between ECM and ignition coil, and then try another ECM.
OK
TRY ANOTHER IGNITION COIL

7. Using a spark plug socket, install the spark plugs.
8. Install the spark plug cable and ignition coil.

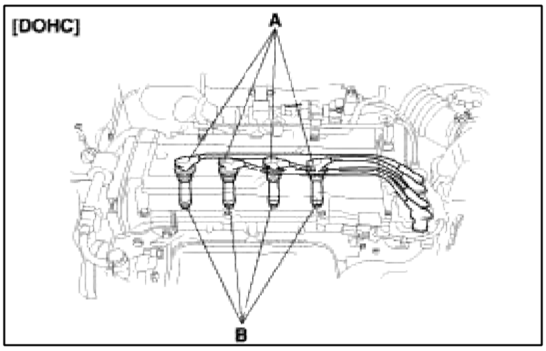
INSPECT SPARK PLUG AND SPARK PLUG CABLE

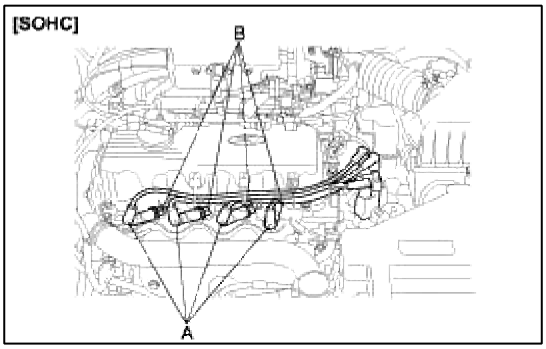
1. Remove the spark plug cable(A).

> **NOTE**
>
> When removing the spark plug cable, pull on the spark plug cable boot (not the cable), as it may be damaged.

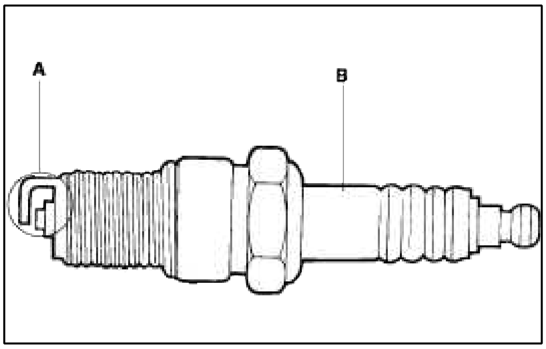
2. Using a spark plug socket, remove the spark plug(B).

> **CAUTION**
>
> Be careful that no contaminats enter through the spark plug holes.





3. Inspect the electrodes(A) and ceramic insulator(B).

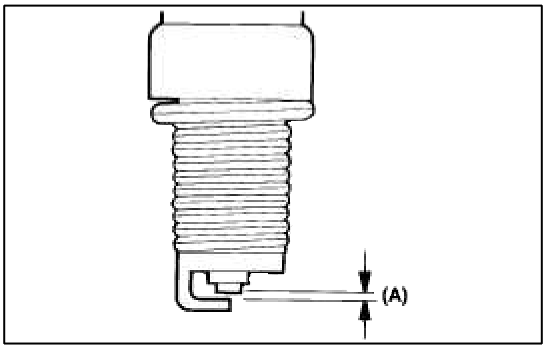


INSPECTION FO ELECTRODES

CONDITION	DARK DEPOSITS	WITHE DEPOSITS
DESCRIPTION	- Fuel mixture too rich - Low air intake	- Fuel mixture too lean - Advanced ignition timing - Insufficient plug tightening

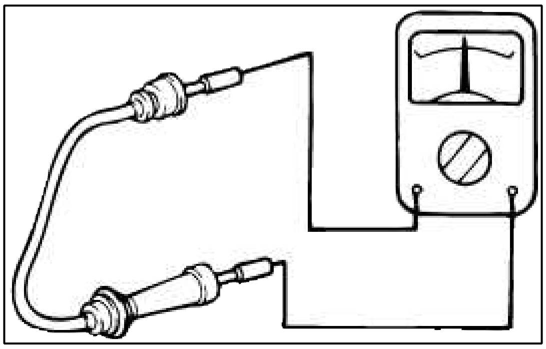
4. Check the electrode gap(A).

Standard (New)
1.0~1.1 mm (0.039~0.043 in.)



5. Carefully remove the spark plug cable by pulling on the rubber boots(A).
   Check the condition of the spark plug cable terminals(B), if any terminal is corroded, clean it, and if it broken or distorted, replace the spark plug cable.
6. Connect the ohmmeter probes and measure resistance.

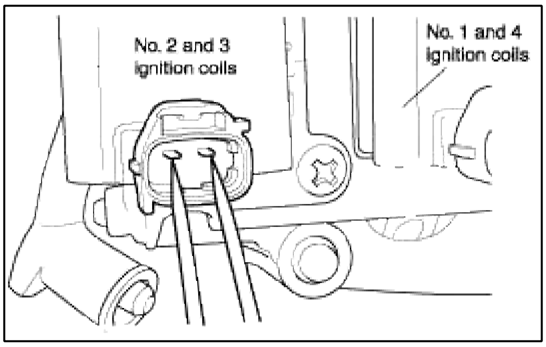
RESISTANCE : 5.6KΩ/m ± 20%



7. Resistance should not be higher than 10K per meter of cable.
   If resistance is higher, replace the cable.

INSPECT IGNITION COIL

1. Measure the primary coil resistance between terminals 1 and 2.



Standard value : 0.87Ω ± 10%

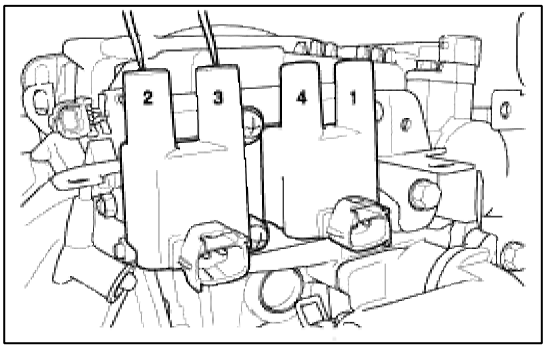
---

2. Measure the secondary coil resistance between the high-voltage terminal for the No.1 and No.4 cylinders, and between the high-voltage terminals for the No.2 and No.3 cylinders.

Standard value : 13.0kΩ ± 15%

CAUTION

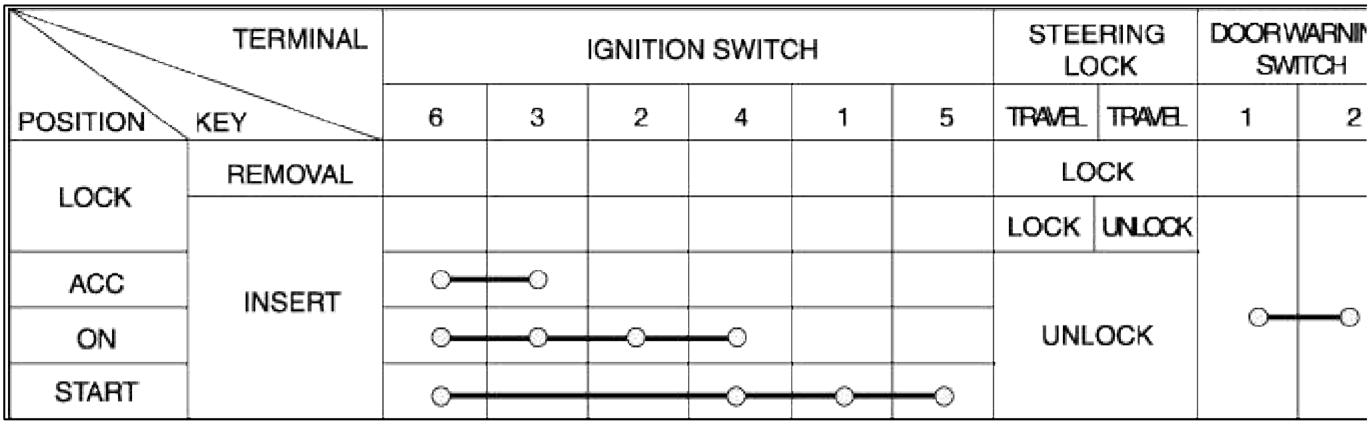
Be sure, when measuring the resistnace of the secondary coil, to disconnect the connector of the ignition coil.



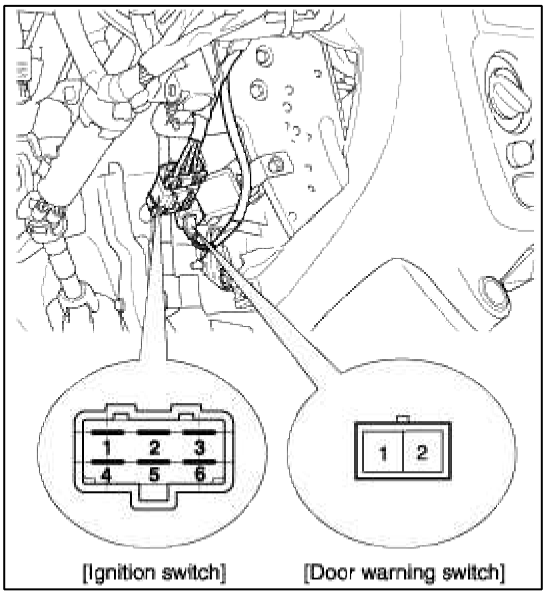
INSPECT IGNITION SWITCH

1. Remove the connector located under the steering column.
2. Check for continuity between terminals.

   If there is no continuity, replace the ignition switch.



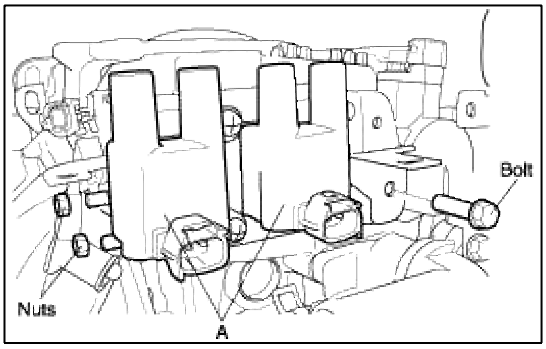
POSITION	KEY \ TERMINAL	IGNITION SWITCH 6	3	2	4	1	5	STEERING LOCK TRAVEL	TRAVEL	DOOR WARNIN SWITCH 1	2
LOCK	REMOVAL							LOCK			
	INSERT							LOCK	UNLOCK	○	○
ACC		○	○					UNLOCK			
ON		○	○	○	○						
START		○			○	○	○				



REPLACEMENT

IGNITION COIL

1. Disconnect the spark plug cable and connector.
2. Remove the ignition coil(A).
3. Installation is the reverse of removal.

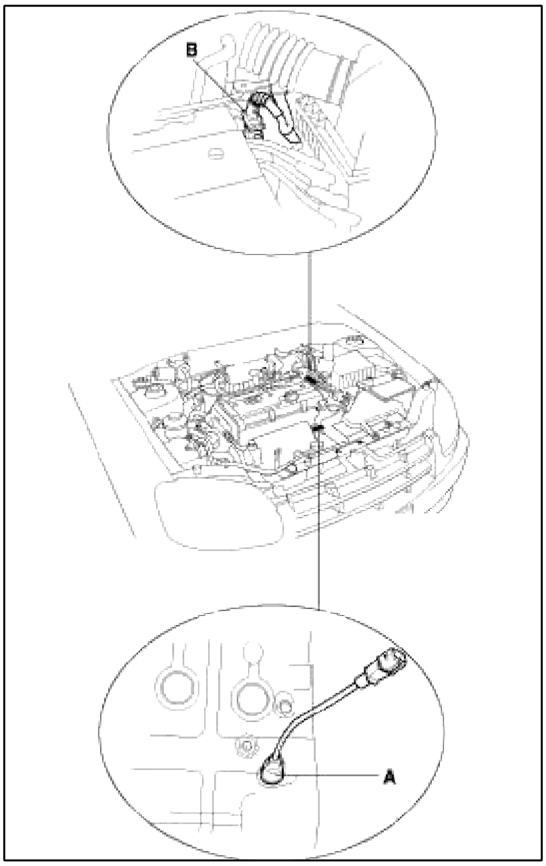


CRANKSHAFT POSITION SENSOR

1. Disconnect the crankshaft position sensor connector.
2. Remove the crankshaft position sensor(A).

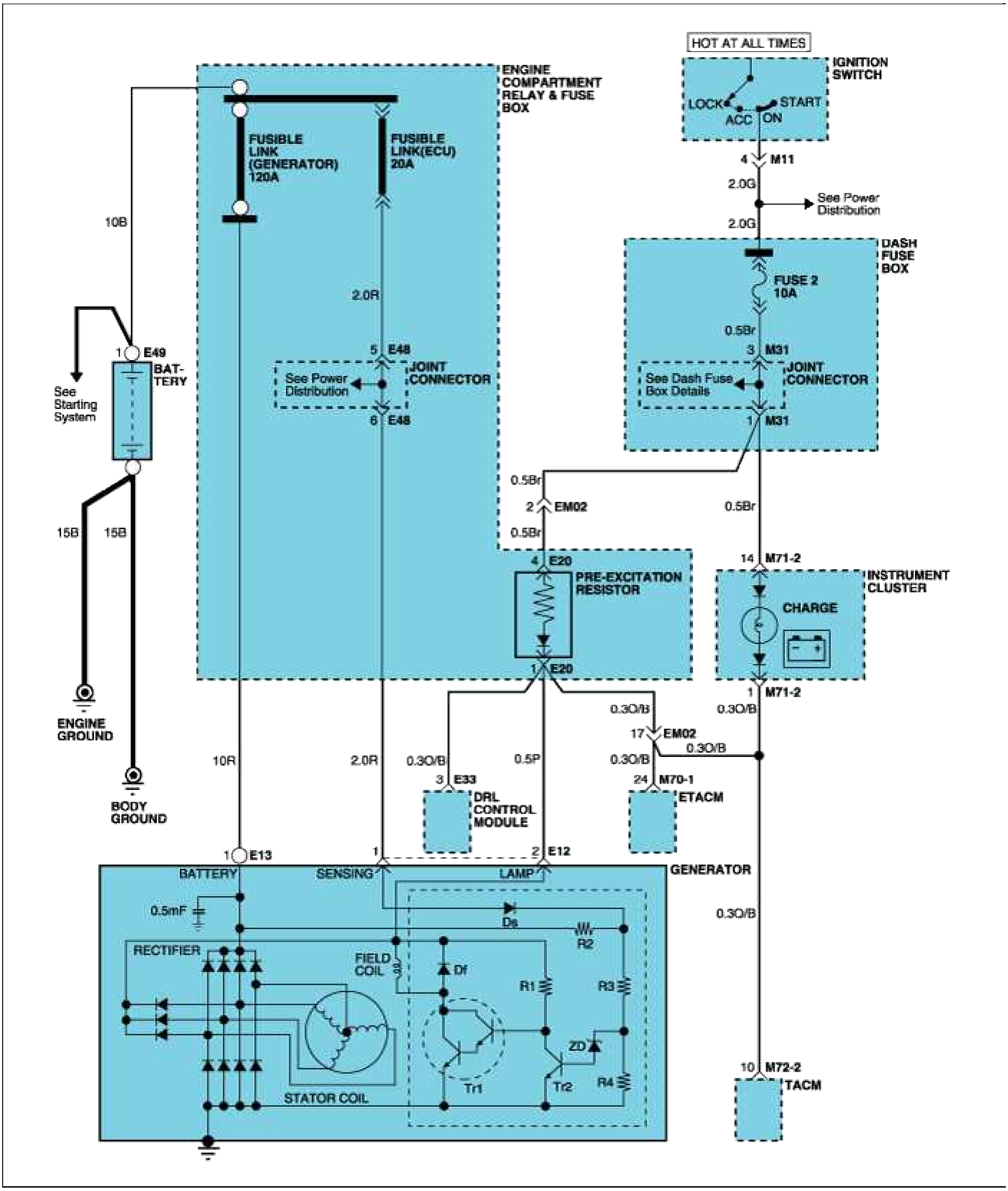
CAMSHAFT POSITION SENSOR

1. Disconnect the camshaft position sensor connector.
2. Remove the camshaft position sensor(B).



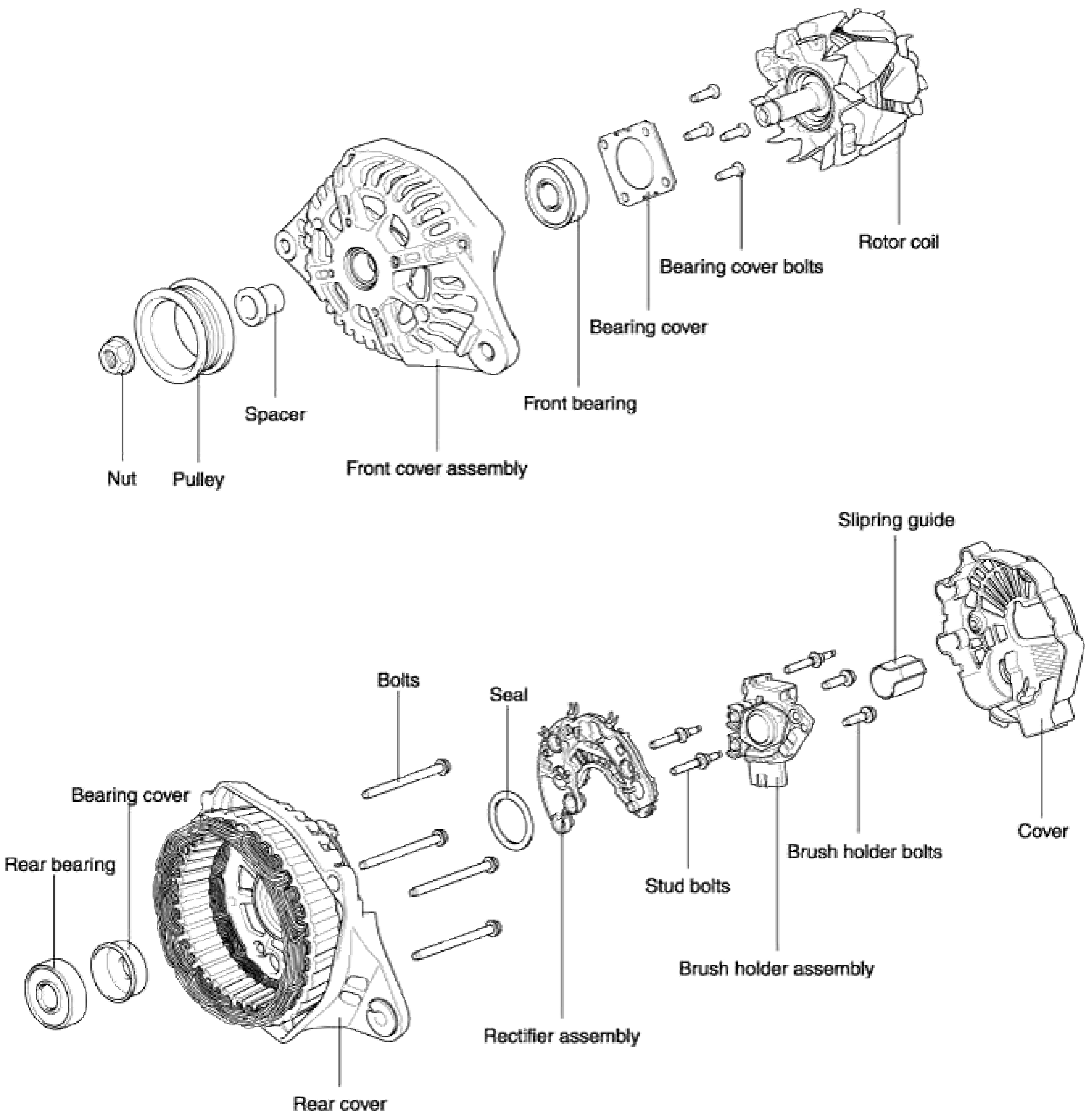
Engine Electrical System > Charging System > Schematic Diagrams

CIRCUIT DIAGRAM FOR CHARGING SYSTEM


HOT AT ALL TIMES
IGNITION SWITCH
LOCK
ACC
ON
START
4 M11
2.0G
See Power Distribution
2.0G
DASH FUSE BOX
FUSE 2 10A
0.5Br
3 M31
See Dash Fuse Box Details
JOINT CONNECTOR
1 M31
ENGINE COMPARTMENT RELAY & FUSE BOX
FUSIBLE LINK (GENERATOR) 120A
FUSIBLE LINK(ECU) 20A
10B
2.0R
5 E48
See Power Distribution
JOINT CONNECTOR
6 E48
1 E49
BAT-TERY
See Starting System
15B
15B
ENGINE GROUND
BODY GROUND
0.5Br
2 EM02
0.5Br
4 E20
PRE-EXCITATION RESISTOR
1 E20
0.5Br
14 M71-2
INSTRUMENT CLUSTER
CHARGE
1 M71-2
0.3O/B
0.3O/B
17 EM02
0.3O/B
0.3O/B
24 M70-1
ETACM
10R
2.0R
0.3O/B
3 E33
DRL CONTROL MODULE
0.5P
1 E13
1
2 E12
GENERATOR
BATTERY
SENSING
LAMP
0.5mF
RECTIFIER
FIELD COIL
Ds
R2
Df
R1
R3
ZD
Tr1
Tr2
R4
STATOR COIL
0.3O/B
10 M72-2
TACM

Engine Electrical System > Charging System > Alternator > Components and Components Location

COMPONENTS

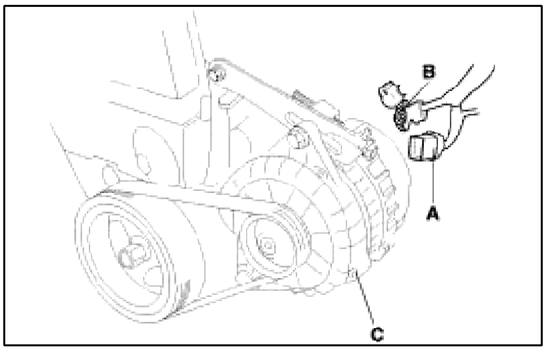

Rotor coil
Bearing cover bolts
Bearing cover
Front bearing
Spacer
Front cover assembly
Nut
Pulley
Slipring guide
Bolts
Seal
Bearing cover
Rear bearing
Cover
Brush holder bolts
Stud bolts
Brush holder assembly
Rectifier assembly
Rear cover

Engine Electrical System > Charging System > Alternator > Repair procedures

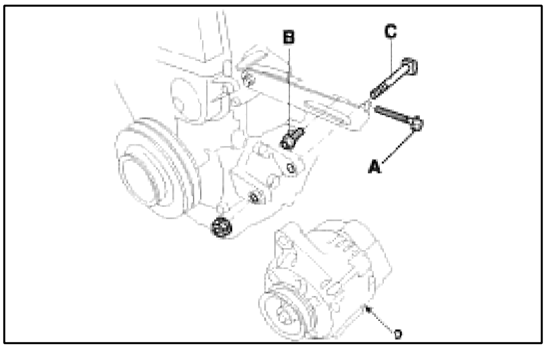
REPLACEMENT

1. Disconnect the battery negative terminal first, then the positive terminal.

2. Deisconnect the generator connector(A) and "B" terminal cable(B) from the generator(C).



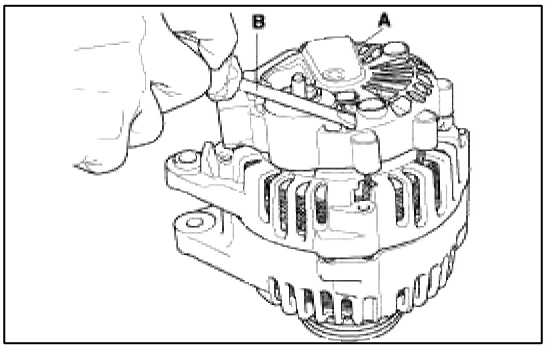
3. Remove the adjusting bolt(A) and mounting bolt(B), then remove the generator belt(C).
4. Pull out the through bolt(C), then remove the generator(D).



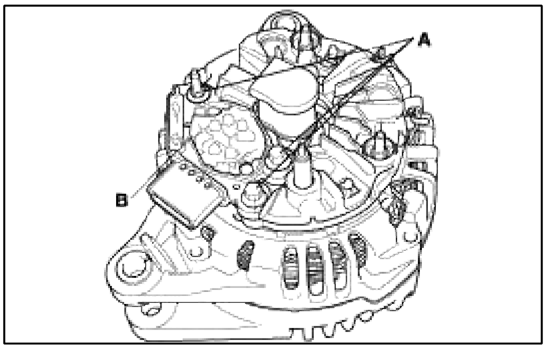
5. Installation is the reverse of removal.
6. Adjust the generator belt tension after installation (See page EE-27).

DISASSEMBLY

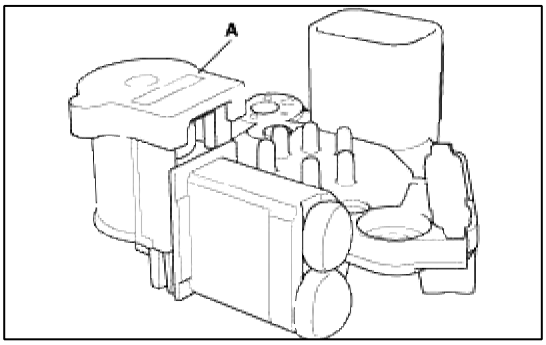
1. Remove the generator cover(A) using a screw driver(B).



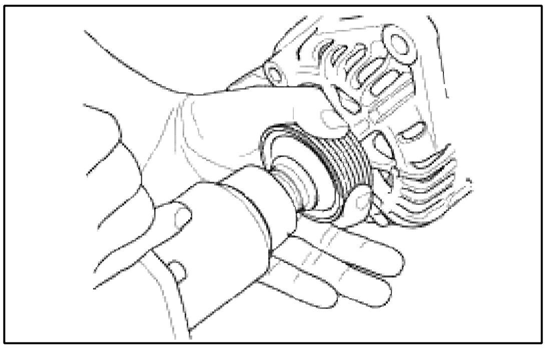
2. Loosen the mounting bolts(A) and disconnect the brush holder assembly(B).



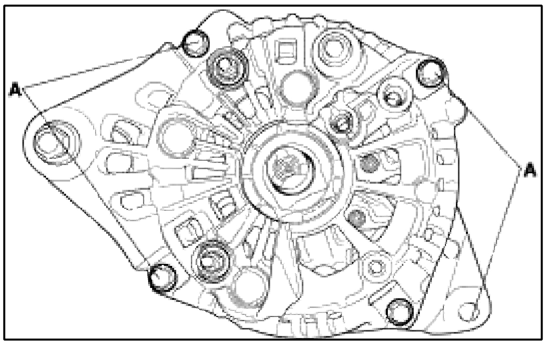
3. Remove the slip ring guide(A).



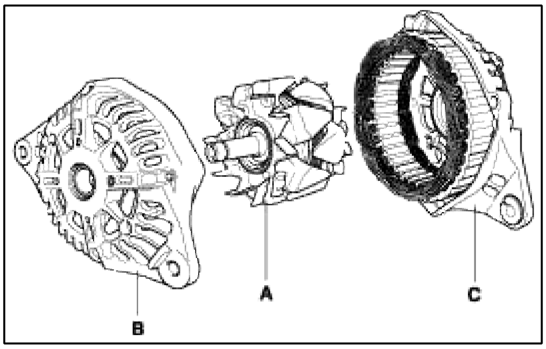
4. Remove the nut, pully and spacer.



5. Loosen the 4 through bolts(A).



6. Disconnect the rotor(A), front cover(B), and rear cover(C).

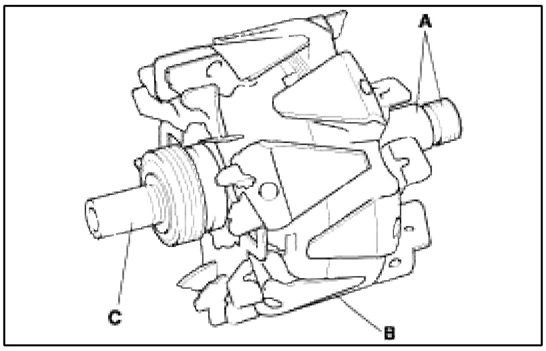


7. Reassembly is the reverse of disassembly.

INSPECTION

INSPECT ROTOR

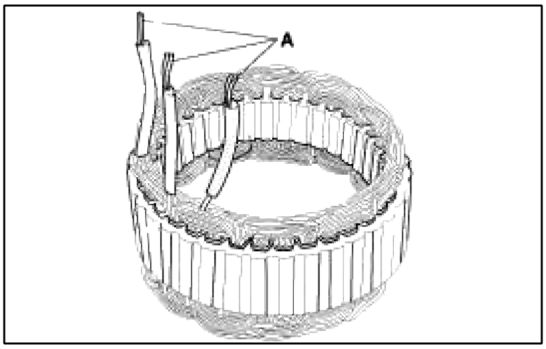
1. Check that there is continuity between the slip rings(A).



2. Check that there is no continuity between the slip rings and the rotor or rotor shaft.
3. If the rotor fails either continuity check, replace the generator.

INSPECT STATOR

1. Check that there is continuity between each pair of leads(A).



2. Check that there is no continuity between each lead and the coil core.
3. If the coil fails either continuity check, replace the generator.

ALTERNATOR BELT INSPECTION AND ADJUSTMENT

NOTE

When using a new belt, first adjust the deflection or tension to the values for the new belt, then readjust the deflection or tension to the values for the used belt after running engine for five minutes.

Deflection method :

Apply a force of 98N (10 kgf, 22 lbf), and measure the deflection between the alternator and crankshaft pulley.

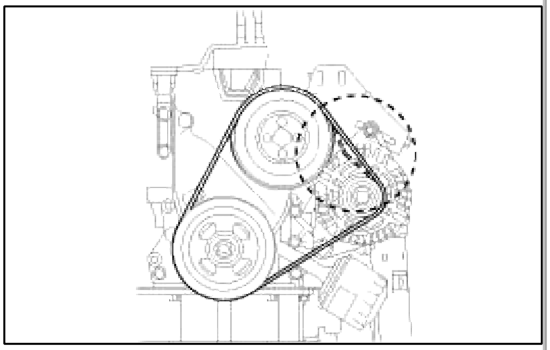
Deflection

Used Belt : 8.5 ~ 11.5 mm (0.33 ~ 0345 in)

New Belt : 5.5 ~ 8.0 mm (0.22 ~ 0361 in)

NOTE

If the belt is worn or damaged, replace it.



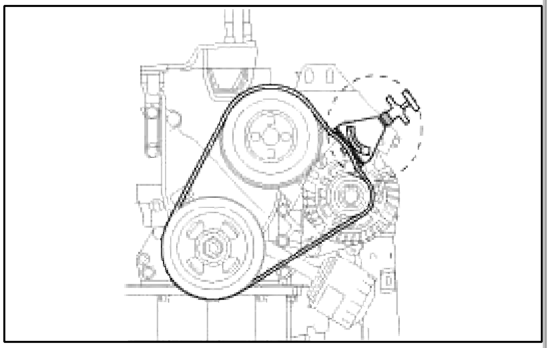
Belt tension gauge method :

Attach the belt tension gauge to the belt and measure the tension. Follow the gauge manufacturer's instructions.

Tension
Used Belt : 340~490 N (35~50 kgf, 77~110 lbf)
New Belt : 690~880 N (70~90 kgf, 150~200 lbf)

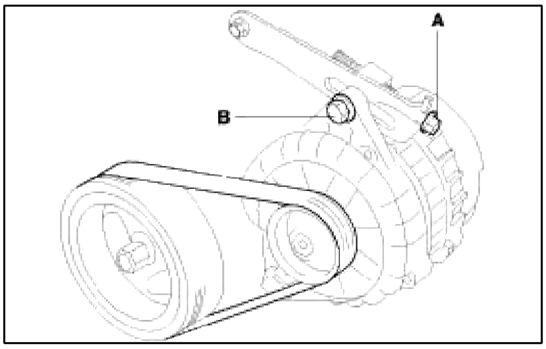
NOTE

If the belt is worn or damaged, replace it.



If adjustment is necessary :

1. Loosen the adjusting bolt(A) and the lock bolt(B).
2. Move the alternator to obtain the proper belt tension, then retighten the nuts.



3. Recheck the deflection or tension of the belt.

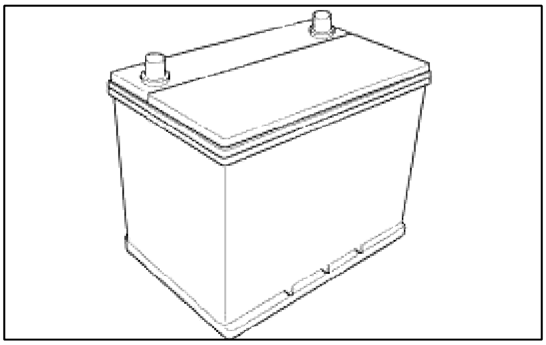
NOTE

For the power steering pump belt and A/C compressor belt adjustments, refer to section 17 and section 22.

Engine Electrical System > Charging System > Battery > Description and Operation

DESCRIPTION

1. The maintenance-free battery is, as the name implies, totally maintenance free and has no removable battery cell caps.
2. Water never needs to be added to the maintenance-free battery.
3. The battery is completely sealed, except for small vent holes in the cover.

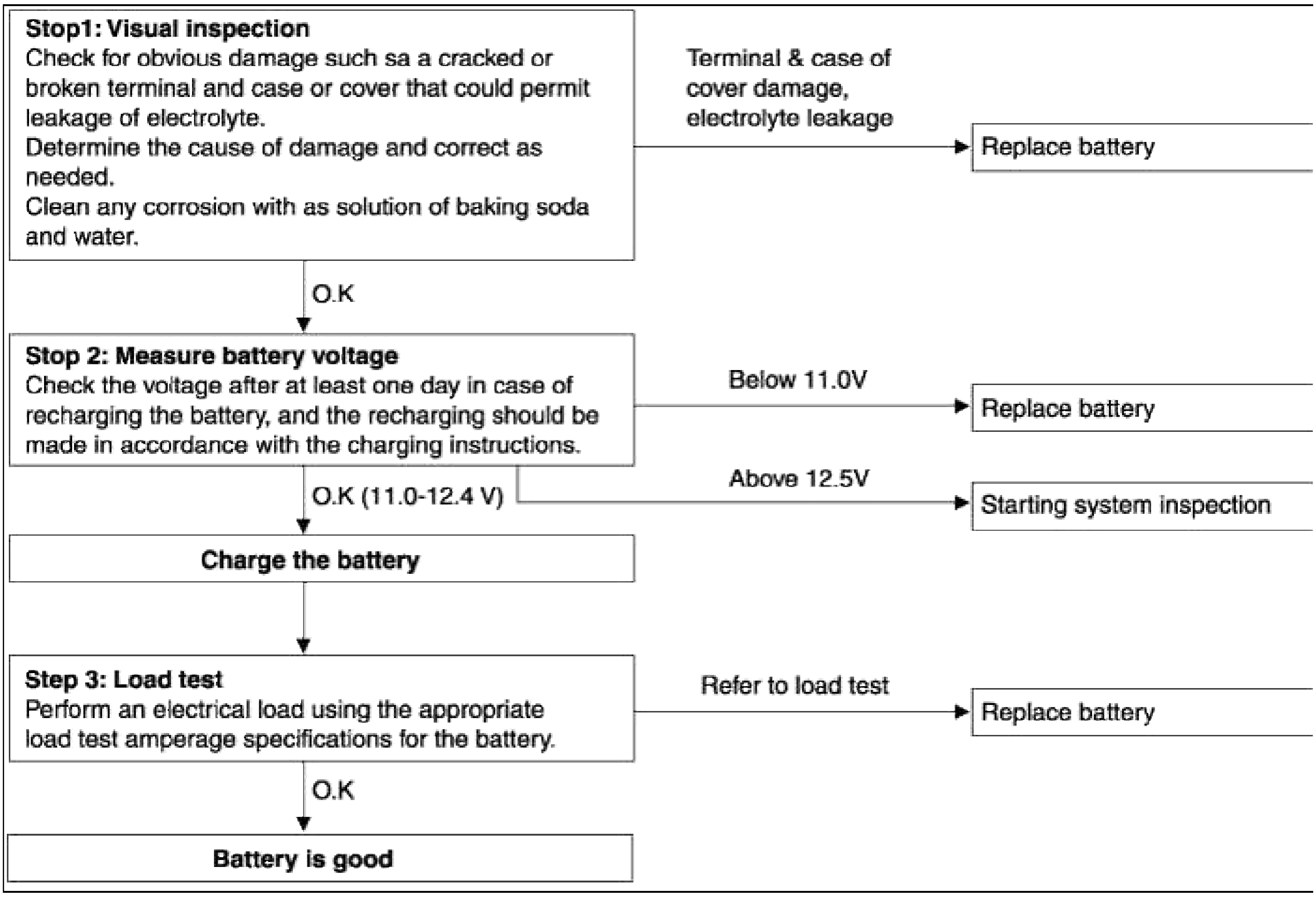


Engine Electrical System > Charging System > Battery > Repair procedures

INSPECTION

BATTERY DIAGNOSTIC TEST (1)

1. CHECKING FLOW


Stop1: Visual inspection
Check for obvious damage such sa a cracked or broken terminal and case or cover that could permit leakage of electrolyte.
Determine the cause of damage and correct as needed.
Clean any corrosion with as solution of baking soda and water.
Terminal & case of cover damage, electrolyte leakage
Replace battery
O.K
Stop 2: Measure battery voltage
Check the voltage after at least one day in case of recharging the battery, and the recharging should be made in accordance with the charging instructions.
Below 11.0V
Replace battery
Above 12.5V
Starting system inspection
O.K (11.0-12.4 V)
Charge the battery
Step 3: Load test
Perform an electrical load using the appropriate load test amperage specifications for the battery.
Refer to load test
Replace battery
O.K
Battery is good

2. CHECKING SHEET

Inspection Items & contents	Judgment criteria	Responsibility		Remarks
		User	Manufacturera	
1. Acid Leakage * Type of acid leakage - Leakage on the fusion part for joining the case and cover. - Leakage on the terminal part - Leakage on the other parts * Clean the wet part or wash it, then dry it before checking with naked eyes. * Determine a part where leakage might have occurred ; check it by tipping the battery, if the leakage takes place again. * Conduct a visual inspection for breakage, deformation, or cracks.	1. Damage in the case or cover due to outside impact.	○		
	2. Acid leakage on the molding part of the case or cover. (weld line or gate hole)		○	
	3. Damage on the terminal or cracks in the cover.	○		
	4. Acid leakage due to the tipped battery or slant storage.	○		
	5. Acid leakage due to poor welding of he cover. (with no damage)		○	

2. Outside damage and breakage * Check with naked eyes.	1. Outside damage due to causes without damage due to mistreatment.		○	
	2. Outside damage due to mistreatment.	○		
	3. Damage due to a spark between terminals.		○	
	4. Damage and breakage due to heat.	○		
3. Measure the voltage for the battery ; but wait at least one day before measuring in case of recharging, and recharging should be made in accordance with the charging instructions.	1. 12.0V	○		Refer to load test
	2. 11.0V< battery voltage<12.0V due to over-discharge.	○		Refer to load test
	3. Below 11.0V due to charge condition failure.	○		Refer to load test
	4. Below 11.0V due to discharged for a long period.	○		Refer to load test
	5. Below 11.0V due to internal short circuit.		○	Refer to load test
4. Load test ; For 15 seconds with a half of the CCA electric current value, but the voltage on the dischaarging stage should be above 9.6V (27±5°C) - Conduct the test with a battery tester. (Refer to the tester manual)	1. Load test result: below 9.5V		○	
	2. Load test result: above 9.6V	○		Mfg. Defect usable

3. LOAD TEST

1. Perform the following steps to complete the load test procedure for maintenance free batteries.
2. Connect the load tester clamps to the terminals and proceed with the test as follow :
   A. If the battery has been on charge, remove the surface charge by connect a 300 ampere load for 15 seconds.
   B. Connect the voltmeter and apply the specified load.
   C. Read the voltage after the load has been applied for 15 seconds.
   D. Disconnect the load.
   E. Compare the voltage reading with the minimum and replace the battery if battery test voltage is below that shown in the voltage table.

Voltage	Temperature
9.6	20°C (70°F) and above
9.5	16 °C (60 °F)
9.4	10 °C (50 °F)
9.3	4 °C (40 °F)
9.1	-1 °C (30 °F)
8.9	-7 °C (20 °F)
8.7	-12 °C (10 °F)
8.5	-18 °C (0 °F)

NOTE

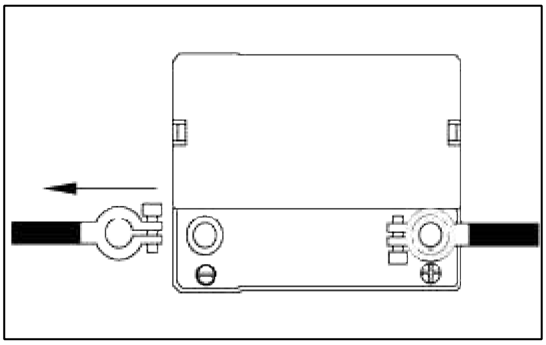
- If the voltage is less than shown in the table, the battery is good.
- If the voltage is greater than shown in the table, replace the battery.

BATTERY DIAGNOSTIC TEST (2)

1. Make sure the ignition switch and all accessories are in the OFF position.
2. Disconnect the battery cables (negative first).
3. Remove the battery from the vehicle.

CAUTION

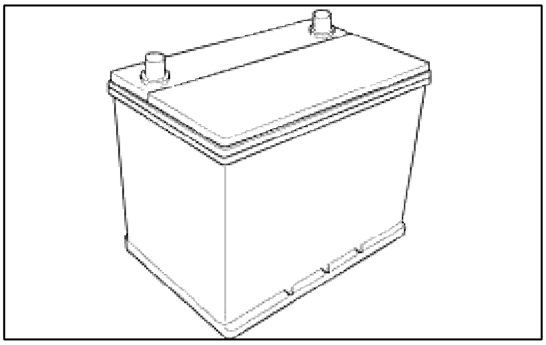
Care should be taken in the event the battery case is cracked or leaking, to protect your skin from the electrolyte. Heavy rubber gloves (not the household type) should be worn when removing the battery.



4. Inspect the battery carrier for damage caused by the loss of electrolyte. If acid damage is present, it will be necessary to clean the area with a solution of clean warm water and baking soda. Scrub the area with a stiff brush and wipe off with a cloth moistened with baking soda and water.
5. Clean the top of the battery with the same solution as described in Step(3).
6. Inspect the battery case and cover for cracks. If cracks are present, the battery must be replaced.
7. Clean the battery posts with a suitable battery post tool.
8. Clean the inside surface of the terminal clamps with a suitable battery cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
9. Install the battery in the vehicle.
10. Connect the cable terminals to the battery post, making sure the tops of the terminals are flush with the tops of the posts.
11. Tighten the terminal nuts securely.

12. Coat all connections with light mineral grease after tightening.

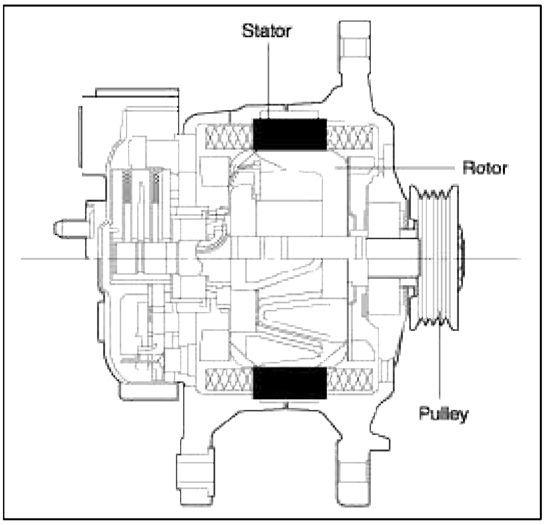
> **CAUTION**
>
> When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries being charged or which have recently been charged. Do not break live circuits at the terminals of batteries being charged. A spark will occur when the circuit is broken. Keep open flames away from the battery.



Engine Electrical System > Charging System > Description and Operation

DESCRIPTION

The charging system included a battery, an generator with a built-in regulator, and the charging indicator light and wire.
The generator has six built-in diodes (three positive and three negtive), each rectifying AC current to DC current.
Therefore, DC curent appears at generator "B" terminal.
In addition, the charging voltage of this generator is regulated by the battery voltage detection system.
The generator is regulated by the battery voltage detection system. The main components of the generator are the rotor, stator, rectifier, capacitor brushes, bearings and V-ribbed belt pulley. The brush holder contains a built-in electronic voltage regulator.



Engine Electrical System > Charging System > Repair procedures

ON-VEHICLE INSPECTION

CAUTION

- Check that the battery cables are connected to the correct terminals.
- Disconnect the battery cables when the battery is given a quick charge.
- Do not perform tests with a high voltage insulation resistance tester.
- Never disconnect the battery while the engine is running.

CHECK BATTERY VOLTAGE

1. After having driven the vehicle and in the case that 20 minutes have not passed after having stopped the engine, turn the ignition switch ON and turn on the electrical system (headlamp, blower motor, rear defogger etc.) for 60 seconds to remove the surface charge.
2. Turn the ignition switch OFF and turn off the electrical systems.
3. Measure the battery voltage between the negative (-) and positive (+) terminals of the battery.

   Standard voltage : 12.5~12.9V at 20°C (68°C)

   If the voltage is less than specification, charge the battery.

CHECK BATTERY TERMINALS, FUSIBLE LINK AND FUSES

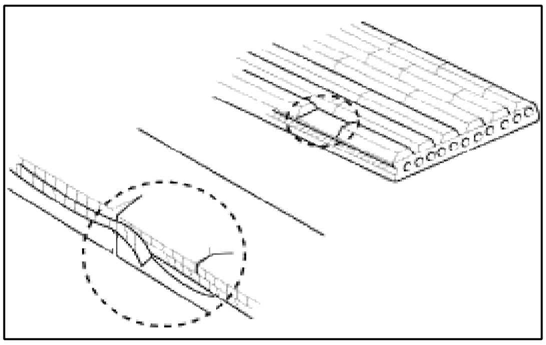
1. Check that the battery terminals are not loose or corroded.
2. Check the fusible link and fuses for continuity.

INSPECT DRIVE BELT

1. Visually check the belt for excessive wear, frayed cords etc.
   If any defect has been found, replace the drive belt.

NOTE

Cracks on the rib side of a belt are considered acceptable. If the belt has chunks missing from the ribs, it should be replaced.

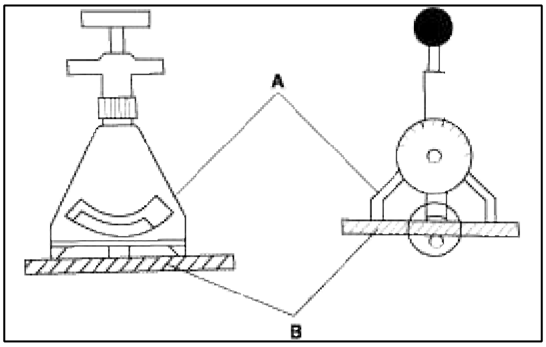


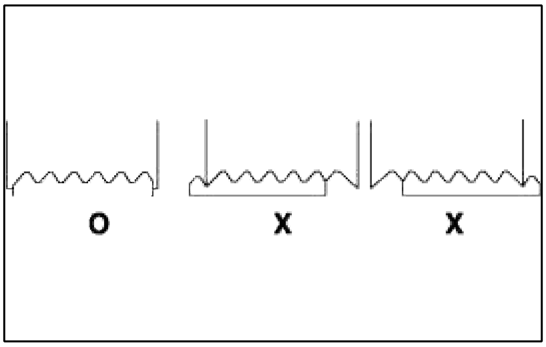
2. Using a belt tension gauge, measure the drive belt tension.

DRIVE BELT TENSION

New belt	690~880 N (150~200 lb)
Used belt	340~490 N (77~110 lb)

If the belt tension is not as specified, adjust it.





NOTE

- "New belt" refers to a belt which has been used less than 5 minutes on a running engine.
- "Used belt" refers to a belt which has been used on a running engine for 5 minutes or more.
- After installing a belt, check that it fits properly in the ribbed grooves.
- Check with your hand to confirm that the belt has not slipped out of the groove on the bottom of the pulley.
- After installing a new belt, run the engine for about 5 minutes and recheck the belt tension.

VISUALLY CHECK GENERATOR WIRING AND LISTEN FOR ABNORMAL NOISES

1. Check that the wiring is in good condition.
2. Check that there is no abnormal noise from the generator while the engine is running.

CHECK DISCHARGE WARNING LIGHT CIRCUIT

1. Warm up the engine and then turn it off.
2. Turn off all accessories.
3. Turn the ignition switch "ON". Check that the discharge warning light is lit.
4. Start the engine. Check that the light goes off.

INSPECT CHARGING SYSTEM

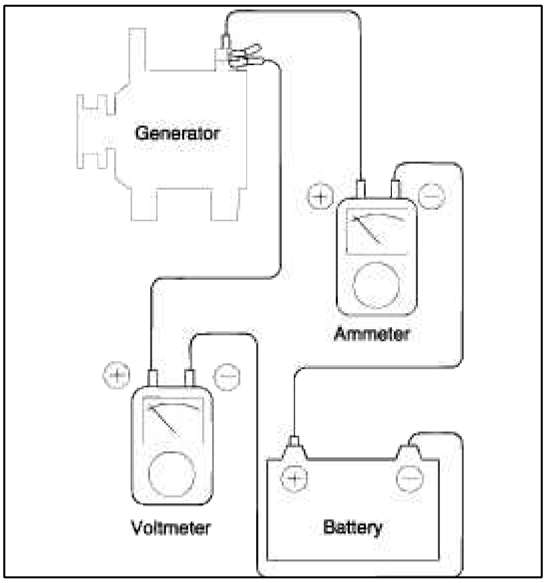
PREPARATION

1. Turn the ignition switch to "OFF".

NOTE

To find abnormal conditions of the connection, actions should not be taken on the two terminals and each connection during the test.

2. Connect a digital voltmeter between the generator "B" terminal and battery (+) lead wire to the battery (+) terminal. Connect the (+) lead wire of the voltmeter to the "B" terminal and the (-) lead wire to the battery (+) terminal.



CONDITIONS FOR THE TEST

1. Start the engine.
2. Switch on the headlamps, blower motor and so on. And then, read the voltmeter under this condition.

RESULT

1. The voltmeter may indicate the standard value.

   0.2V max.

2. If the value of the voltmeter is higher than expected (above 0.2V max.), poor wiring is suspected. In this case check the wiring from the generator "B" terminal to the fusible link to the battery (+) terminal. Check for loose connections, color change due to an overheated harness, etc. Correct them before testing again.
3. Upon completion of the test, set the engine speed at idle. Turn off the head lamps, blower motor and the ignition switch.

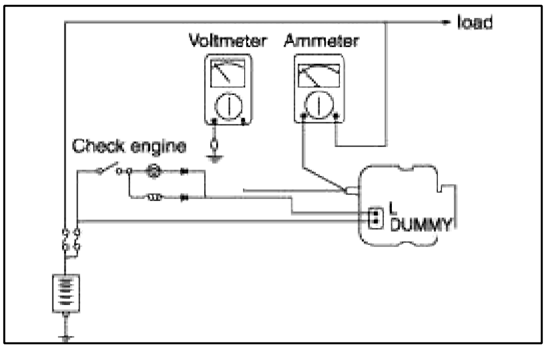
PREPARATION

1. Prior to the test, check the following items and correct as necessary.
   Check the battery installed in the vehicle to ensure that it is in good condition. The battery checking method is described in "BATTERY".
   The battery that is used to test the output current should be one that has been partially discharged. With a fully charged battery, the test may not be conducted correctly due to an insufficient load.
   Check the tension of the generator drive belt. The belt tension check method is described in the section "COOLING".
2. Turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Disconnect the generator output wire from the generator "B" terminal.
5. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Be sure to connect the (-) lead wire of the ammeter to the disconnected output wire.

   > NOTE
   >
   > Tighten each connection securely, as a heavy current will flow. Do not rely on clips.

6. Connect a voltmeter (0 to 20V) between the "B" terminal and ground. Connect the (+) lead wire to the generator "B" terminal and (-) lead wire to a good ground.

7. Attach an engine tachometer and connect the battery ground cable.
8. Leave the engine hood open.



TEST

1. Check to see that the voltmeter reads as the same value as the battery voltage. If the voltmeter reads 0V, and the open circuit in the wire between the generator "B" terminal and battery (-) terminal, a blown fusible link or poor grounding is suspected.
2. Start the engine and turn on the headlights.
3. Set the headlights to high beam and the heater blower switch to HIGH, quickly increase the engine speed to 2,500 rpm and read the maximum output current value indicated by the ammeter.

NOTE

After the engine starts up, the charging current quickly drops. Therefore, the above operation must be done quickly to readthe maximum current value correctly.

RESULT

1. The ammeter reading must be higher than the limit value. If it is lower but the generator output wire is in good condition, remove the generator from the vehicle and test it.

63A min.

NOTE

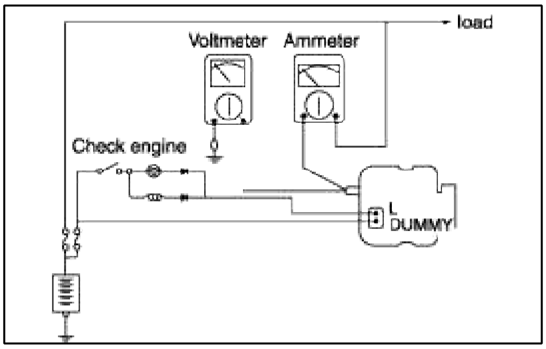
- The nominal output current value is shown on the nameplate affixed to the generator body.
- The output current value changes with the electrical load and the temperature of the generator itself. Therefore, the nominal output current may not be obtained. If such is the case, keep the headlights on the cause discharge of the battery, or use the lights of another vehicle to increase the electrical load. The nominal output current may not be obtained if the temperature of the generator itself or ambient temperature is too high.
  In such a case, reduce the temperature before testing again.

2. Upon completion of the output current test, lower the engine speed to idle and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the ammeter and voltmeter and the engine tachometer.
5. Connect the generator output wire to the generator "B" terminal.
6. Connect the battery ground cable.

PREPARATION

1. Prior to the test, check the following items and correct if necessary.
   Check that the battery installed on the vehicle is fully charged. For battery checking method, see "BATTERY".
   Check the generator drive belt tension. For belt tension check, see "COOLING" section.
2. Turn ignition switch to "OFF".
3. Disconnect the battery ground cable.

4. Connect a digital voltmeter between the "B" terminal of the generator and ground. Connect the (+) lead of the voltmeter to the "B" terminal of the generator. Connect the (-) lead to good ground or the battery (-) terminal.
5. Disconnect the generator output wire from the generator "B" terminal.
6. Connect a DC ammeter (0 to 100A) in series between the "B" terminal and the disconnected output wire. Connect the (-) lead wire of the ammeter to the disconnected output wire.
7. Attach the engine tachometer and connect the battery ground cable.



TEST

1. Turn on the ignition switch and check to see that the voltmeter indicates the following value.

   Battery voltage

   If it reads 0V, there is an open circuit in the wire between the generator "B" terminal and the battery and the battery (-), or the fusible link is blown.
2. Start the engine. Keep all lights and accessories off.
3. Run the engine at a speed of about 2,500 rpm and read the voltmeter when the generator output current drops to 10A or less.

RESULT

1. If the voltmeter reading agrees with the value listed in the Regulating Voltage Table below, the voltage regulator is functioning correctly. If the reading is other than the standard value, the voltage regulator or the generator is faulty.

   Regulating Voltage Table

Voltage regulator ambient temperature °C (°F)	Regulating voltage (V)
-20 (-4)	14.2 ~ 15.4
20 (68)	14.0 ~ 15.0
60 (140)	13.7 ~ 14.9
80 (176)	13.5 ~ 14.7

2. Upon completion of the test, reduce the engine speed to idle, and turn off the ignition switch.
3. Disconnect the battery ground cable.
4. Remove the voltmeter and ammeter and the engine tachometer.
5. Connect the generator output wire to the generator "B" terminal.
6. Connect the battery ground cable.

1. Be sure to check the following before testing:
   Generator installation and wiring connections
   Generator drive belt tension
   Fusible link
   Abnormal noise from the generator while the engine is running
2. Turn the ignition switch to the OFF position.
3. Disconnect the negative battery cable.

4. Disconnect the generator output wire from the generator "B" terminal. Connect a DC test ammeter with a range of 0-100A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal. Connect the (-) lead of the ammeter to the disconnected output wire).

> **NOTE**
>
> An inductive-type ammeter which enables measurements to be taken without disconnecting the generator output wire is recommended. Using this equipment will lessen the possibility of a voltage drop caused by a loose "B" terminal connection.

5. Connect a digital-type voltmeter between the generator "B" terminal and the battery (+) terminal. (Connect the (+) lead of the voltmeter to the "B" terminal. Connect the (-) lead of the voltmeter to the battery (+) cable.
6. Reconnect the negative battery cable.
7. Connect a tachometer or the scan tool.
8. Start the engine.
9. With the engine running at approx. 2500 r/min, turn the headlights and other lights on and off to adjust the generator load on the ammeter slightly above 30A.

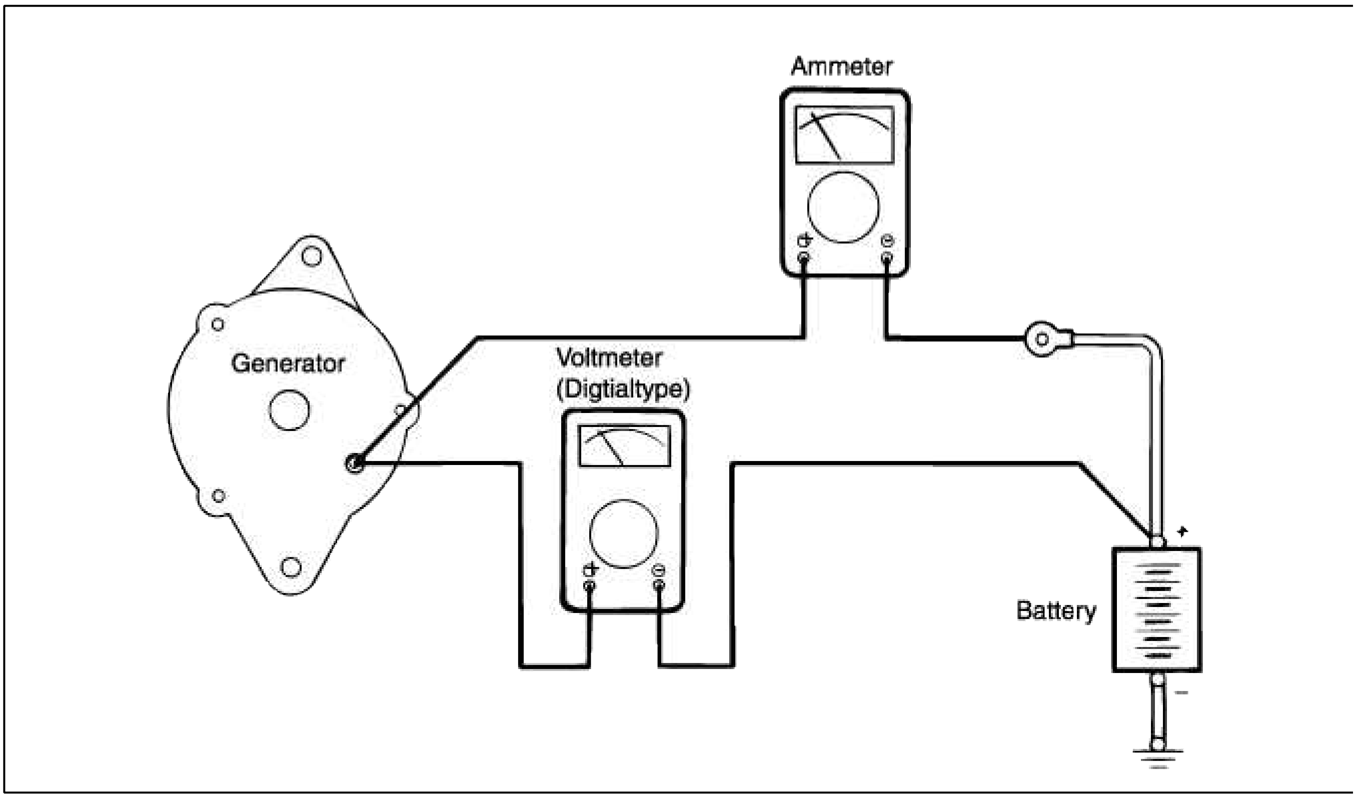
---

max. 0.3V

> **NOTE**
>
> When the generator output is high and the value displayed on the ammeter does not decrease to 30A, set the value to 40A.Read the value displayed on the voltmeter. In this case the limit becomes max. 0.4V.

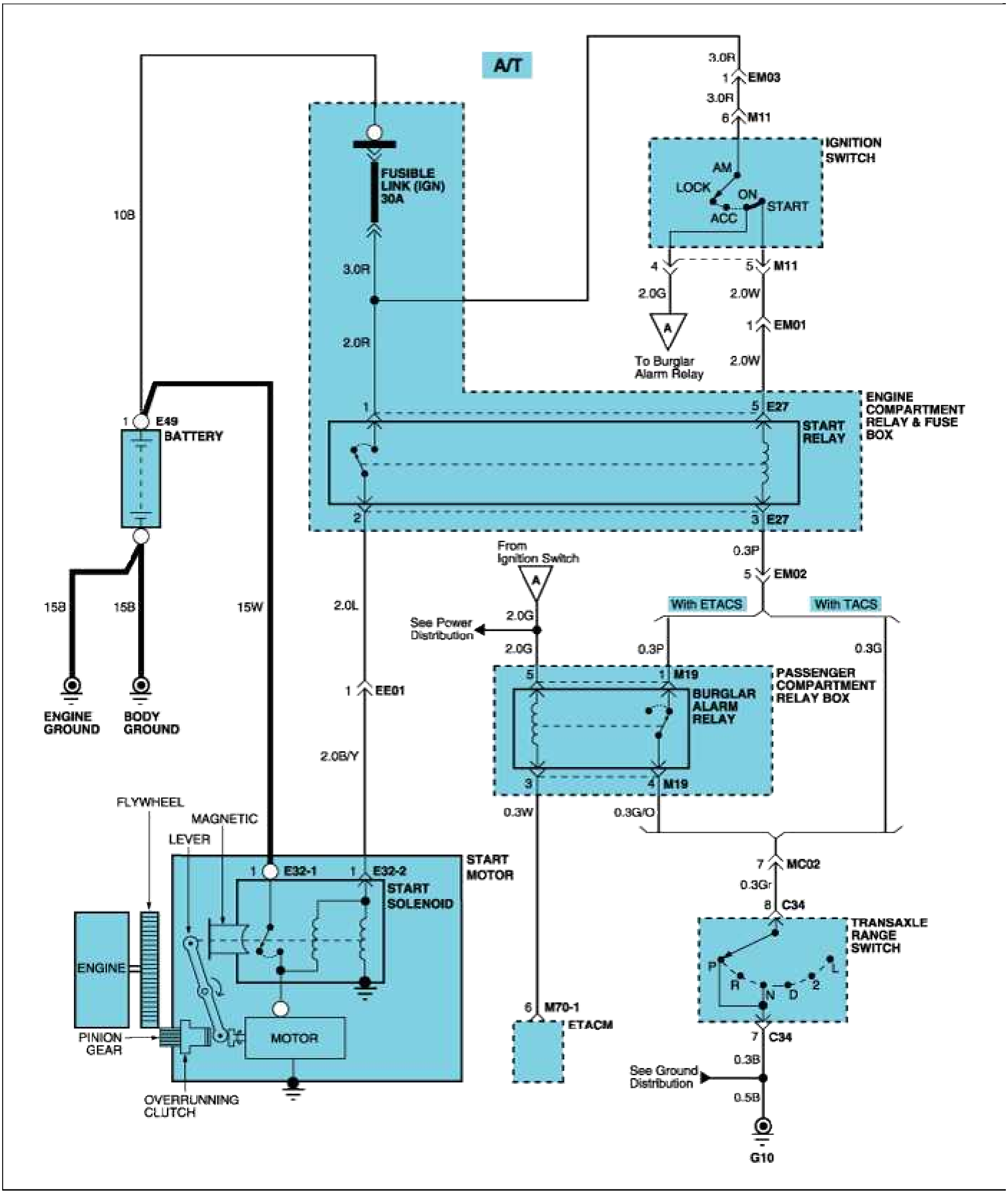
10. If the value displayed on the voltmeter is still above the limit, a malfunction in the generator output wire may exist. Check the wiring between the generator "B" terminal and the battery (+) terminal (including fusible link). If a terminal is not sufficiently tight or if the harness has become discolored due to overheating, repair, the test again.
11. After the test, run the engine at idle.
12. Turn off all lights and turn the ignition switch to the OFF position.
13. Disconnect the tachometer or the scan tool.
14. Disconnect the negative battery cable.
15. Disconnect the ammeter and voltmeter.
16. Connect the generator output wire to the generator "B" terminal.

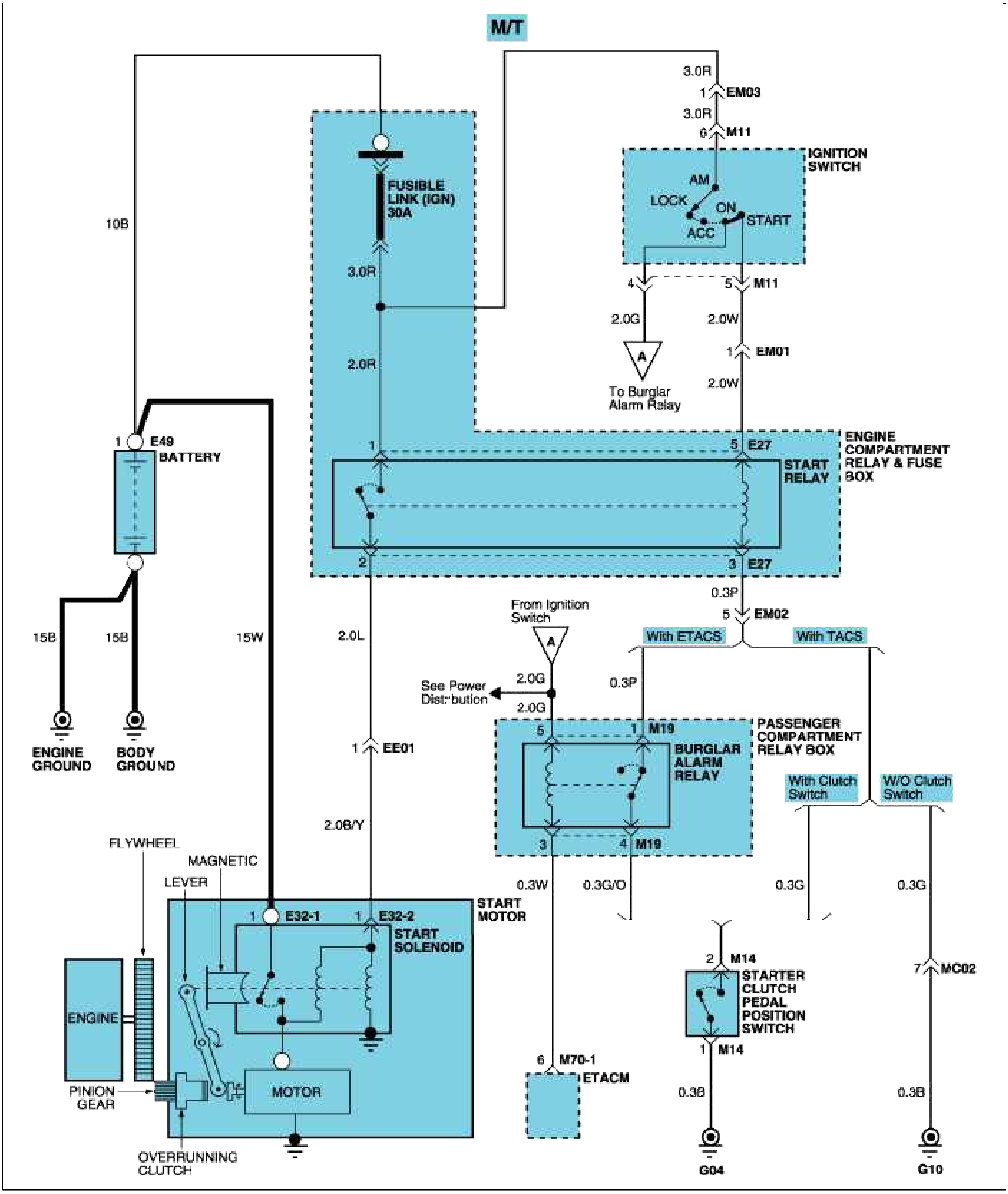
17. Connect the negative battery cable.


Ammeter
Generator
Voltmeter
(Digtialtype)
+
Battery
−

Engine Electrical System > Starting System > Schematic Diagrams

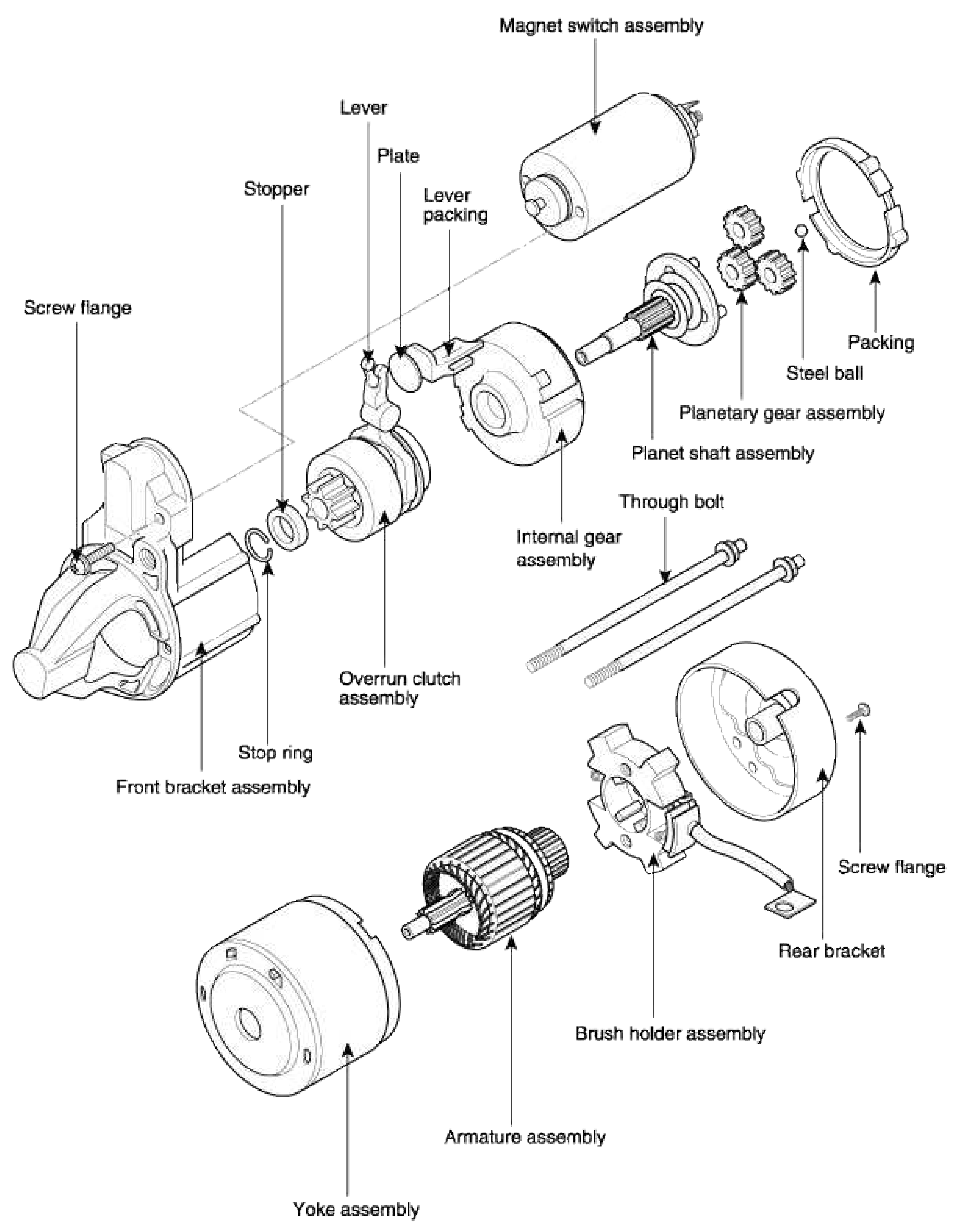
CIRCUIT DIAGRAM FOR STARTING SYSTEM


A/T
3.0R
1 EM03
3.0R
6 M11
IGNITION SWITCH
AM
LOCK
ON
START
ACC
4
5 M11
2.0G
2.0W
A
To Burglar Alarm Relay
1 EM01
2.0W
10B
FUSIBLE LINK (IGN) 30A
3.0R
2.0R
1
5 E27
START RELAY
ENGINE COMPARTMENT RELAY & FUSE BOX
2
3 E27
1 E49
BATTERY
15B
15B
15W
ENGINE GROUND
BODY GROUND
2.0L
1 EE01
2.0B/Y
0.3P
5 EM02
From Ignition Switch
A
With ETACS
With TACS
See Power Distribution
2.0G
2.0G
0.3P
0.3G
5
1 M19
BURGLAR ALARM RELAY
PASSENGER COMPARTMENT RELAY BOX
3
4 M19
0.3W
0.3G/O
7 MC02
0.3Gr
8 C34
TRANSAXLE RANGE SWITCH
P
R
N
D
2
L
7 C34
0.3B
See Ground Distribution
0.5B
G10
6 M70-1
ETACM
FLYWHEEL
MAGNETIC
LEVER
1 E32-1
1 E32-2
START MOTOR
START SOLENOID
ENGINE
MOTOR
PINION GEAR
OVERRUNNING CLUTCH


M/T
10B
FUSIBLE LINK (IGN) 30A
3.0R
2.0R
3.0R
1 EM03
3.0R
6 M11
IGNITION SWITCH
AM
LOCK
ON
START
ACC
4
5 M11
2.0G
2.0W
A
To Burglar Alarm Relay
1 EM01
2.0W
1 E49
BATTERY
1
5 E27
START RELAY
ENGINE COMPARTMENT RELAY & FUSE BOX
2
3 E27
0.3P
5 EM02
From Ignition Switch
A
With ETACS
With TACS
15B
15B
15W
2.0L
See Power Distribution
2.0G
2.0G
0.3P
5
1 M19
BURGLAR ALARM RELAY
PASSENGER COMPARTMENT RELAY BOX
ENGINE GROUND
BODY GROUND
1 EE01
With Clutch Switch
W/O Clutch Switch
2.0B/Y
3
4 M19
FLYWHEEL
MAGNETIC
LEVER
0.3W
0.3G/O
0.3G
0.3G
1 E32-1
1 E32-2
START MOTOR
START SOLENOID
2 M14
STARTER CLUTCH PEDAL POSITION SWITCH
7 MC02
ENGINE
1 M14
6 M70-1
ETACM
PINION GEAR
MOTOR
0.3B
0.3B
OVERRUNNING CLUTCH
G04
G10

Engine Electrical System > Starting System > Starter > Components and Components Location

COMPONENTS

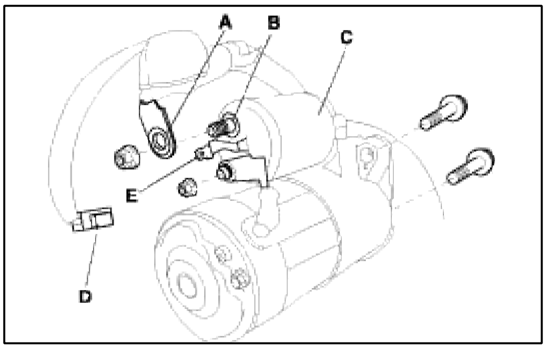

Magnet switch assembly
Lever
Plate
Stopper
Lever packing
Screw flange
Packing
Steel ball
Planetary gear assembly
Planet shaft assembly
Through bolt
Internal gear assembly
Overrun clutch assembly
Stop ring
Front bracket assembly
Screw flange
Rear bracket
Brush holder assembly
Armature assembly
Yoke assembly

Engine Electrical System > Starting System > Starter > Repair procedures

REPLACEMENT

1. Disconnect the battery negative cable.

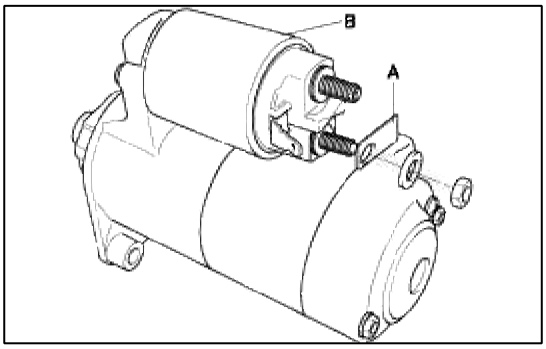
2. Disconnect the starter cable(A) from the B terminal(B) on the solenoid(C), then disconnect the connecto(D) from the S terminal(E).



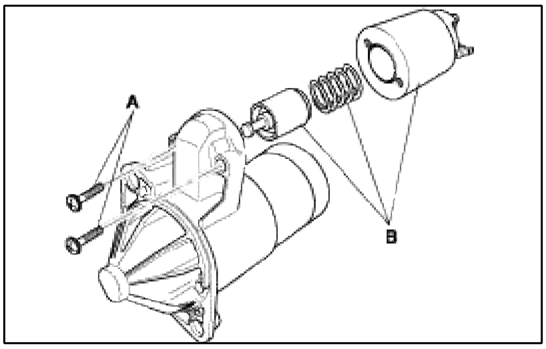
3. Remove the 2 bolts holding the starter, then remove the starter.
4. Installation is the reverse of removal.
5. Connect the battery positive cable and negative cable to the battery.

DISASSEMBLY

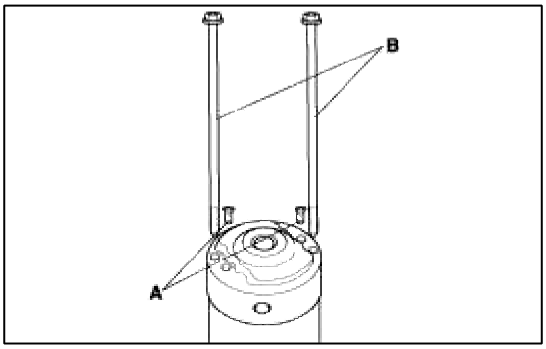
1. Disconnect the M-terminal(A) on the magnet switch assembly(B).



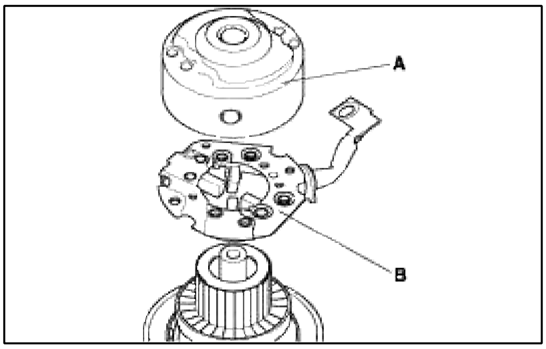
2. After loosening the 2 screws(A), detach the magnet switch assembly(B).



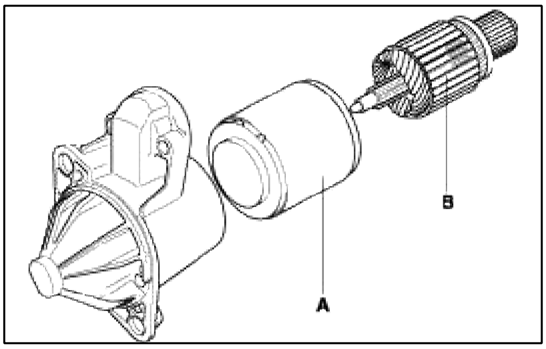
3. Loosen the brush holder mounting screws(A) and through bolts(B).



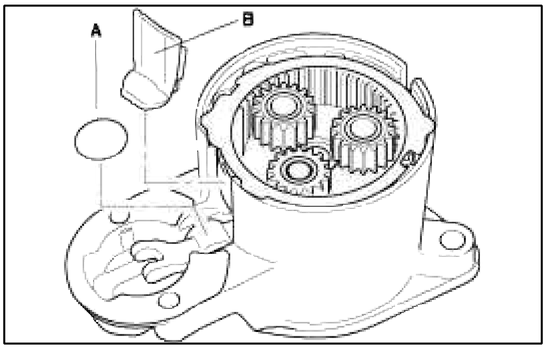
4. Remove the rear bracket(A) and brush holder assembly(B).



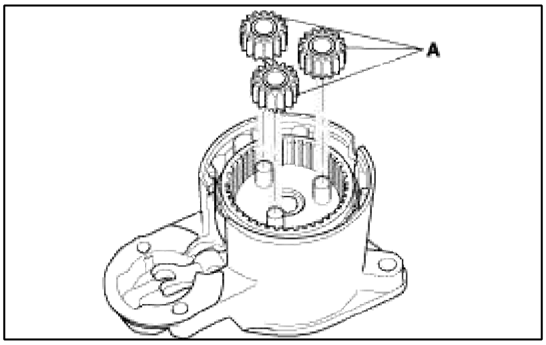
5. Remove the yoke(A) and armature(B).



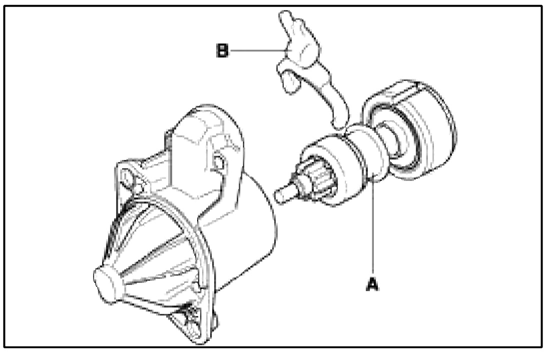
6. Remove the, lever plate(A) and planet shaft packing(B).



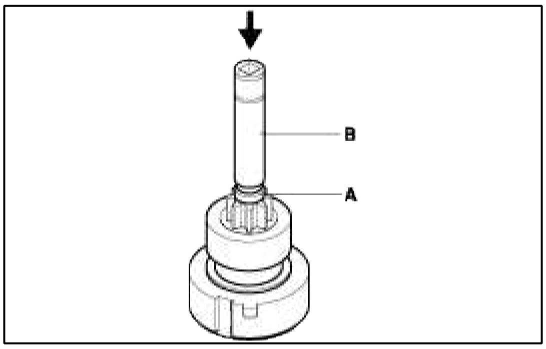
7. Disconnect the planet gear(A).



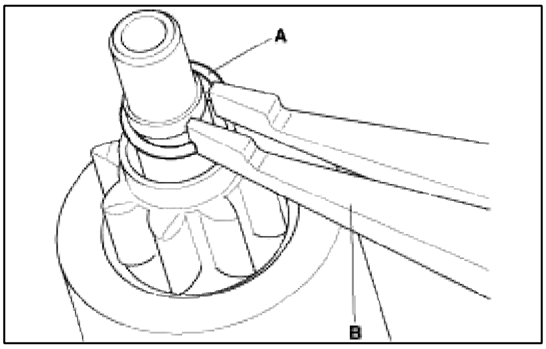
8. Disconnect the planet shaft assembly(A) and lever(B).



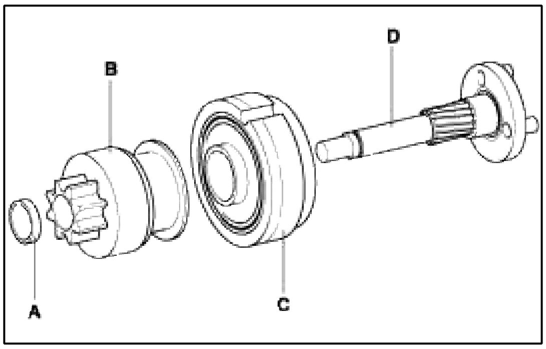
9. Press the stop ring(A) using s socket(B).



10. After removing the stopper(A) using stopper pliers(B).



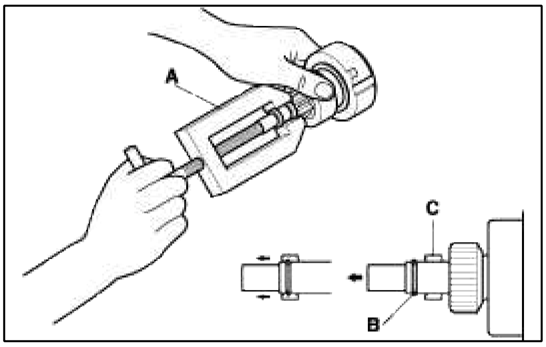
11. Disconnect the stop ring(A), overrunning clutch(B), internal gear(C) andplanet shaft(D).



12. Reassembly is the reverse of disassembly.

NOTE

Using a suitable pulling tool(A), pull the overrunning clutch stopring(B) over the stopper(C).

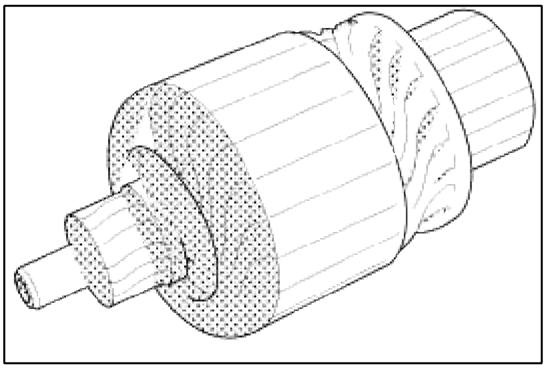


INSPECTION

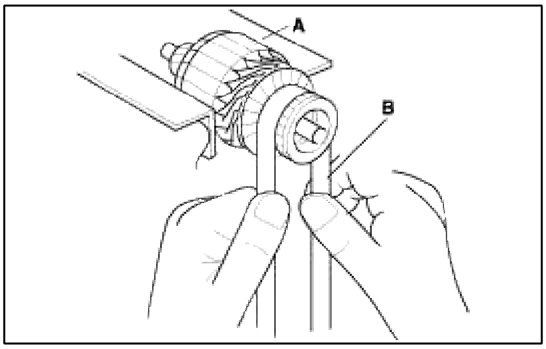
ARMATURE INSPECTION AND TEST

1. Remove the starter.
2. Disassemble the starter as shown at the beginning of this procedure.

3. Inspect the armature for wear or damage from contact with the permanent magnet. If there is wear or damage, replace the armature.

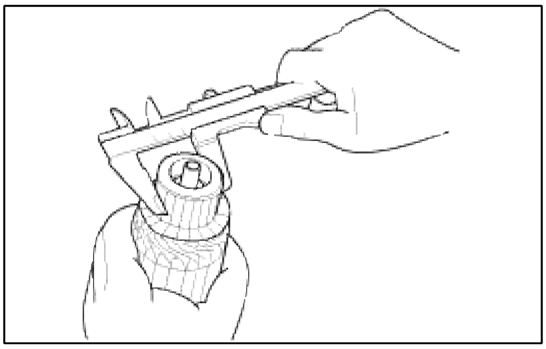


4. Check the commutator (A) surface. If the surface is dirty or burnt, resurface with emery cloth or a lathe within the following specifications, or recondition with #500 or #600 sandpaper (B).



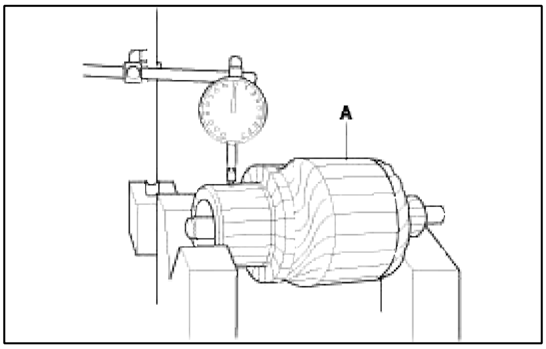
5. Check the commutator diameter. If the diameter is below the service limit, replace the armature.

Commutator diameter
Standard (New) :
M/T : 29.9~30.0 mm (1.177~1.181 in.)
A/T : 28.0 ~ 28.1 mm (1.102~1.106 in.)
Service limit :
M/T : 29.0 mm (1.142 in.)
A/T : 27.5 mm (1.083 in.)



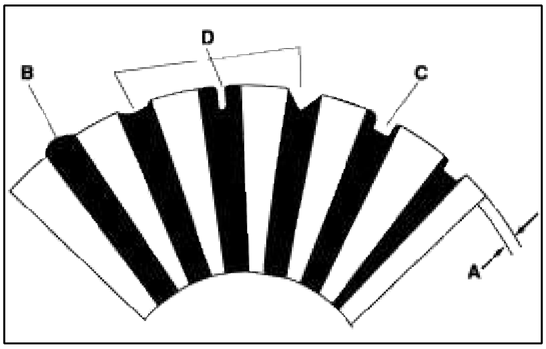
6. Measure the commutator (A) runout.
   - A. If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   - B. If the commutator runout is not within the service limit, replace the armature.

Commutator Runout
Standard (New) : 0.02mm (0.001 in.) max.
Service limit : 0.05mm (0.002 in.)

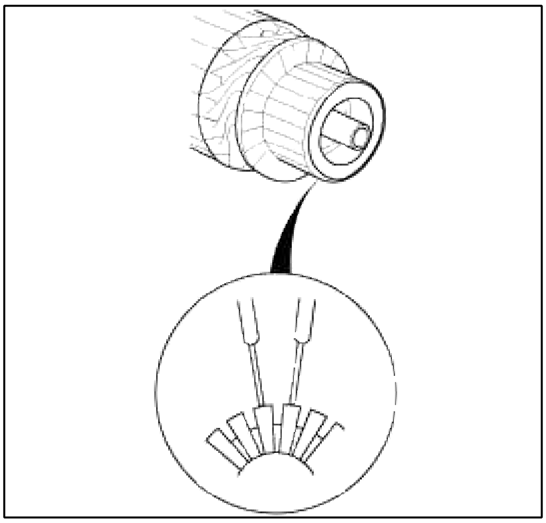


7. Check the mica depth (A). If the mica is too high (B), undercut the mica with a hacksaw blade to the proper depth. Cut away all the mica (C) between the commutator segments. The undercut should not be too shallow, too narrow, or V-shaped (D).

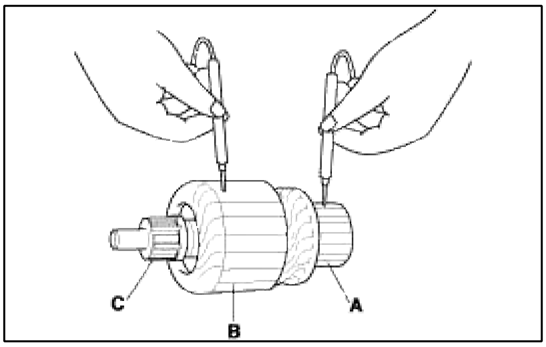
Commutator mica depth
Standard (New) :
M/T : 0.5~0.8 mm (0.020~0.031 in.)
A/T : 0.4~0.5 mm (0.016~0.020 in.)
Service limit :
M/T : 0.2mm (0.008 in.)
A/T : 0.15 mm (0.006 in.)



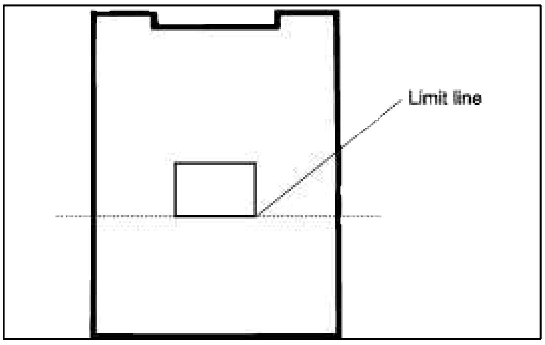
8. Check for continuity between the segments of the commutator. If an open circuit exists between any segments, replace the armature.



9. Check with an ohmmeter that no continuity exists between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If continuity exists, replace the armature.

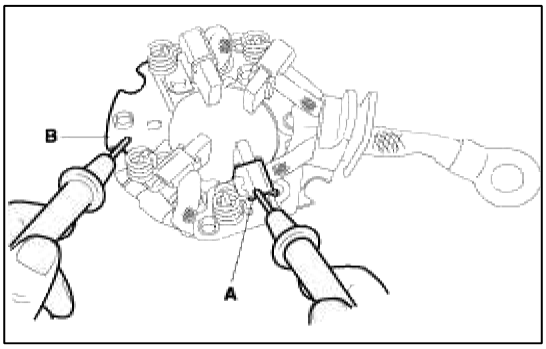


INSPECT STARTER BRUSH



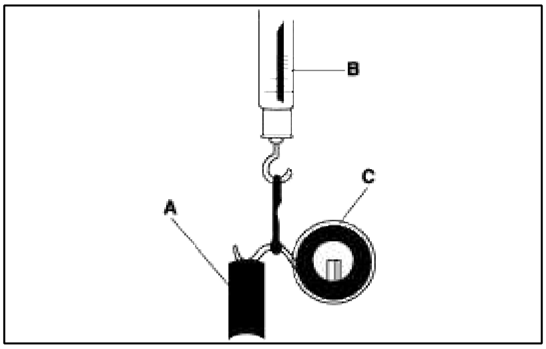
STARTER BRUSH HOLDER TEST

1. Check that there is no continuity between the (+) brush holder (A) and (-) brush holder (B). If there is no continuity, replace the brush holder assembly.

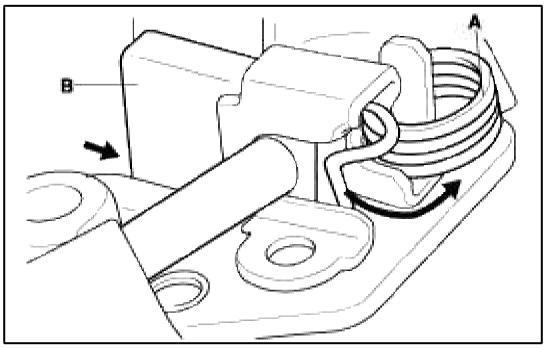


2. Insert the brush (A) into the brush holder, and bring the brush into contact with the commutator, then attach a spring scale (B) to the spring (C). Measure the spring tension at the moment the spring lifts off the brush.

Spring tension
M/T : 13.7~19.6N (1.4~2.0 kgf, 3.07~4.41 lbf)
A/T : 15.7~17.7 N (1.6~1.8 kgf, 3.53~3.97 lbf)



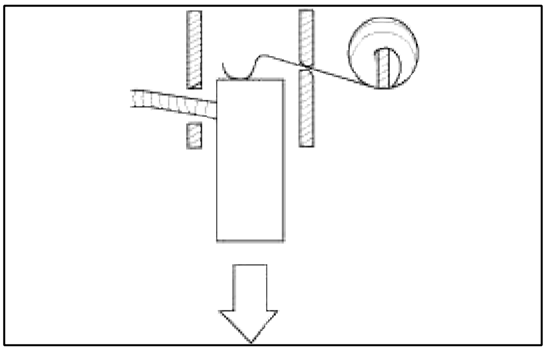
3. Pry back each brush spring(A) with a screwdrive, then position the brush(B) about halfway out of its holder, and release the spring to hold it there.



4. Install the armature in the housing, and install the brush holder. Next, pry back each brush spring again, and push the brush down until it seats against the commutator, then release the spring against the end of the brush.

NOTE

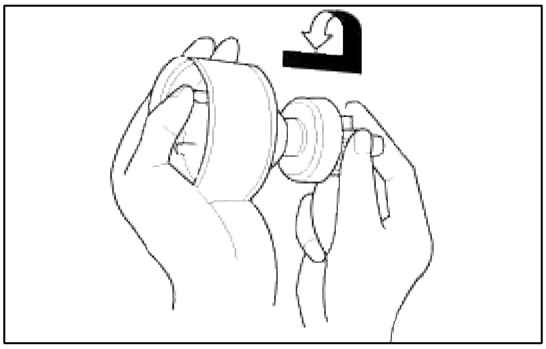
To seat new brushes, slip a strip of #500 or #600 sandpaper, with the grit side up, between the commutator and each brush, and smoothly rotate the armature. The contact surface of the rushes will be sanded to the same contour as the commutator.



INSPECT OVERRUNNING CLUTCH

1. Slide the overrunning clutch along the shaft.
   Replace it if does not slide smoothly.

2. Rotate the overrunning clutch (A) both ways.
   Does it lock in one direction and rotate smoothly in reverse? If it does not lock in either direction or it locks in both directions, replace it.



3. If the starter driver gear (B) is worn or damaged, replace the overrunning clutch assembly: the gear is not available separately.
   Check the condition of the flywheel or torque converter ring gear if the starter drive gear teeth are damaged.

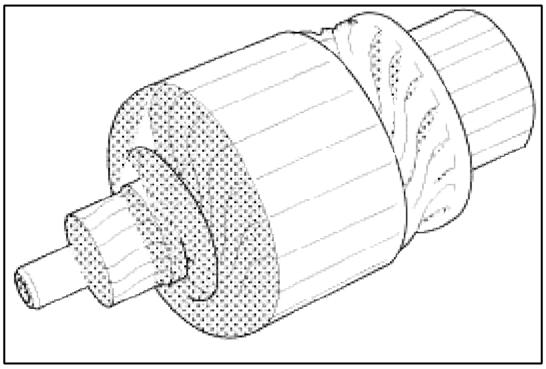
CLEANING

1. Do not immerse parts in cleaning solvent. Immersing the yoke assembly and/or armature will damage the insulation. Wipe these parts with a cloth only.
2. Do not immerse the drive unit in cleaning solvent. The overrun clutch is pre-lubricated at the factory and solvent will wash lubrication from the clutch.
3. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

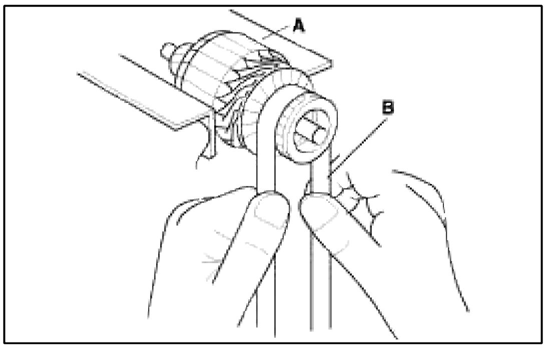
INSPECTION

ARMATURE INSPECTION AND TEST

1. Remove the starter.
2. Disassemble the starter as shown at the beginning of this procedure.
3. Inspect the armature for wear or damage from contact with the permanent magnet. If there is wear or damage, replace the armature.



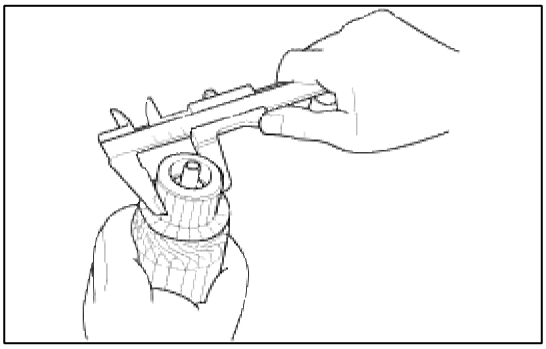
4. Check the commutator (A) surface. If the surface is dirty or burnt, resurface with emery cloth or a lathe within the following specifications, or recondition with #500 or #600 sandpaper (B).



5. Check the commutator diameter. If the diameter is below the service limit, replace the armature.

Commutator diameter

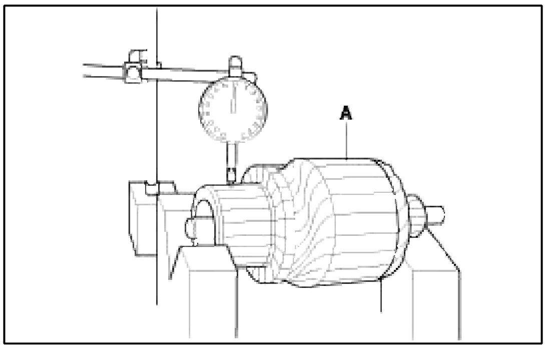
Standard (New) :
M/T : 29.9~30.0 mm (1.177~1.181 in.)
A/T : 28.0 ~ 28.1 mm (1.102~1.106 in.)
Service limit :
M/T : 29.0 mm (1.142 in.)
A/T : 27.5 mm (1.083 in.)



6. Measure the commutator (A) runout.
   - A. If the commutator runout is within the service limit, check the commutator for carbon dust or brass chips between the segments.
   - B. If the commutator runout is not within the service limit, replace the armature.

Commutator Runout

Standard (New) : 0.02mm (0.001 in.) max.
Service limit : 0.05mm (0.002 in.)



7. Check the mica depth (A). If the mica is too high (B), undercut the mica with a hacksaw blade to the proper depth. Cut away all the mica (C) between the commutator segments. The undercut should not be too shallow, too narrow, or V-shaped (D).

Commutator mica depth
Standard (New) :
M/T : 0.5~0.8 mm (0.020~0.031 in.)
A/T : 0.4~0.5 mm (0.016~0.020 in.)
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M/T : 0.2mm (0.008 in.)
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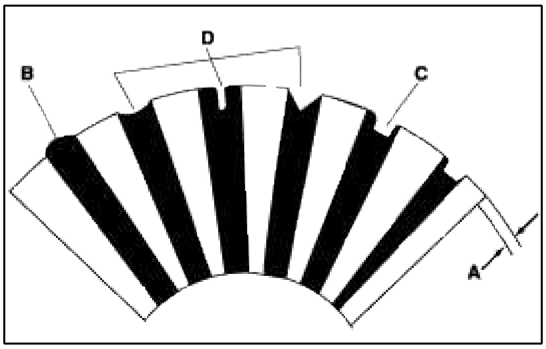
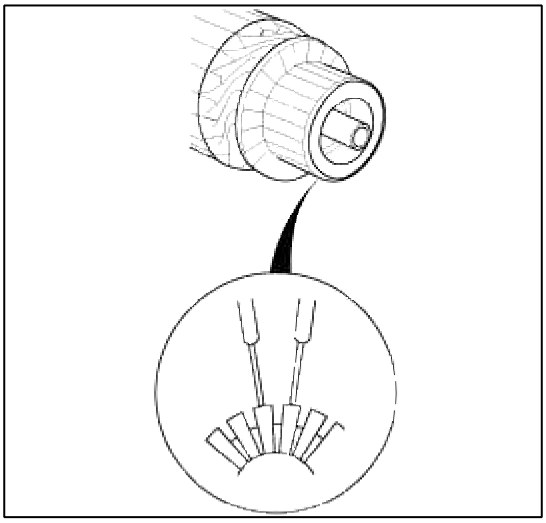
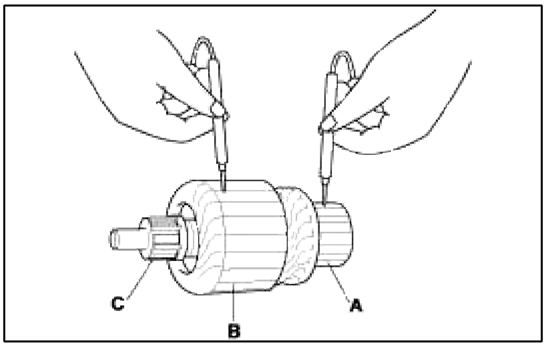


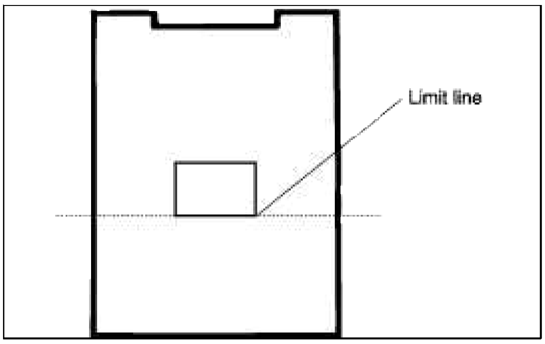
8. Check for continuity between the segments of the commutator. If an open circuit exists between any segments, replace the armature.



9. Check with an ohmmeter that no continuity exists between the commutator (A) and armature coil core (B), and between the commutator and armature shaft (C). If continuity exists, replace the armature.

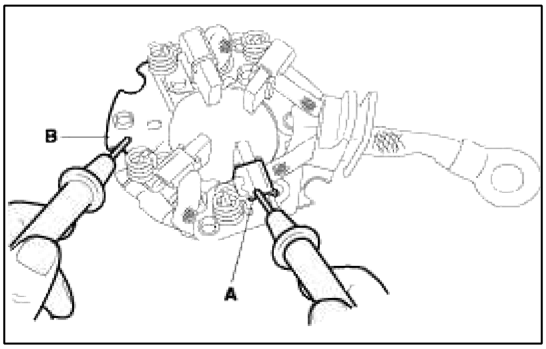


INSPECT STARTER BRUSH



STARTER BRUSH HOLDER TEST

1. Check that there is no continuity between the (+) brush holder (A) and (-) brush holder (B). If there is no continuity, replace the brush holder assembly.

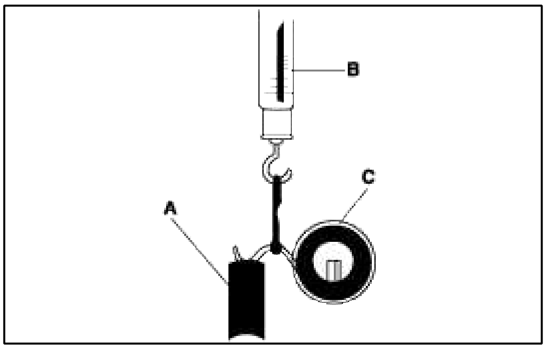


2. Insert the brush (A) into the brush holder, and bring the brush into contact with the commutator, then attach a spring scale (B) to the spring (C). Measure the spring tension at the moment the spring lifts off the brush.

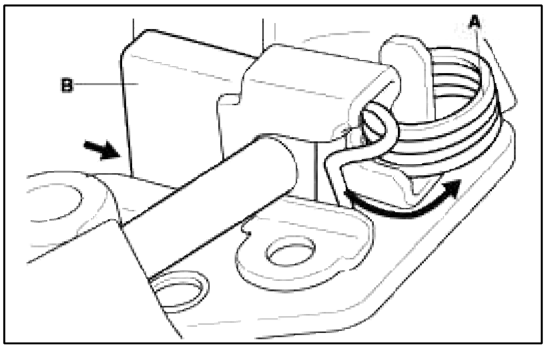
Spring tension

M/T : 13.7~19.6N (1.4~2.0 kgf, 3.07~4.41 lbf)

A/T : 15.7~17.7 N (1.6~1.8 kgf, 3.53~3.97 lbf)



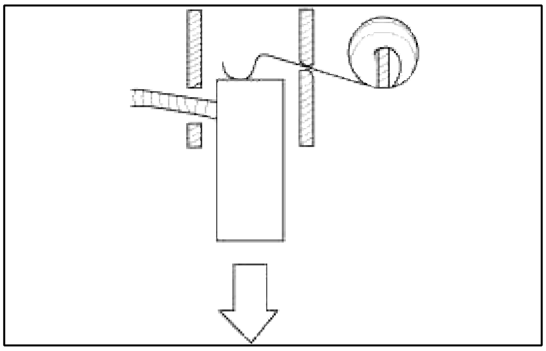
3. Pry back each brush spring(A) with a screwdrive, then position the brush(B) about halfway out of its holder, and release the spring to hold it there.



4. Install the armature in the housing, and install the brush holder. Next, pry back each brush spring again, and push the brush down until it seats against the commutator, then release the spring against the end of the brush.

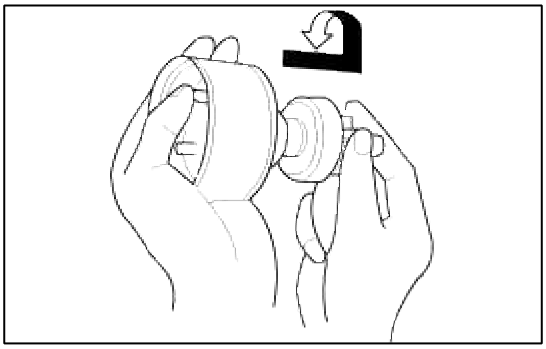
NOTE

To seat new brushes, slip a strip of #500 or #600 sandpaper, with the grit side up, between the commutator and each brush, and smoothly rotate the armature. The contact surface of the rushes will be sanded to the same contour as the commutator.



INSPECT OVERRUNNING CLUTCH

1. Slide the overrunning clutch along the shaft.
   Replace it if does not slide smoothly.
2. Rotate the overrunning clutch (A) both ways.
   Does it lock in one direction and rotate smoothly in reverse? If it does not lock in either direction or it locks in both directions, replace it.

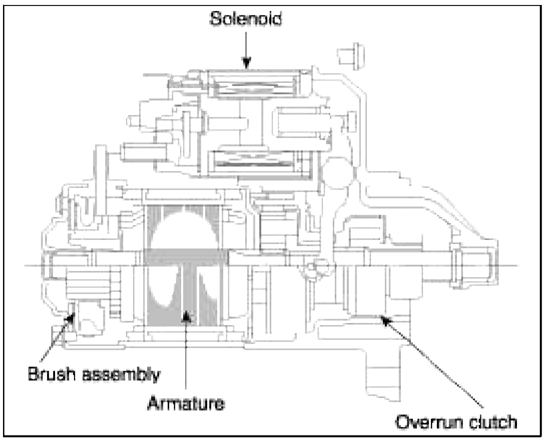


3. If the starter driver gear (B) is worn or damaged, replace the overrunning clutch assembly: the gear is not available separately.
   Check the condition of the flywheel or torque converter ring gear if the starter drive gear teeth are damaged.

Engine Electrical System > Starting System > Description and Operation

DESCRIPTION

The starting system includes the battery, starter motor, solenoid switch, ignition switch, inhibitor switch(A/T), ignition lock switch, connection wires and the battery cable.
When the ignition key is turned to the start position, current flows and energizes the starter motor's solenoid coil.
The solenoid plunger and clutch shift lever are activated, and the clutch pinion engages the ring gear.
The contacts close and the starter motor cranks. In order to prevent damage caused by excessive rotation of the starter armature when the engine starts, the clutch pinion gear overruns.



Engine Electrical System > Starting System > Repair procedures

INSPECTION

START TEST

NOTE

The air temperature must be between 59 and 100°F (15 and 38°C) before testing.

Recommended procedure :

- Use a starter system tester.
- Connect and operate the equipment in accordance with the manufacturer's instructions.
- Test and troubleshoot as described.

Alternate Procedure :

- Use the following equipment :
  - Ammeter, 0~400A
  - Voltmeter, 0~20V (accurate within 0.1 volt)
  - Tachometer, 0~1,200 rpm
- Hook up a voltmeter and ammeter as shown.

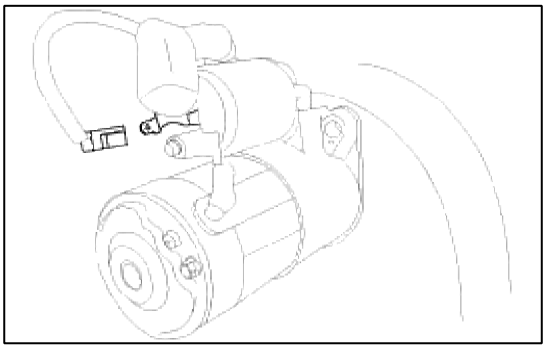
NOTE

After this test, or any subsequent repair, reset the ECM/PCM to clear any codes.

Check the Starter Engagement :

1. Turn the ignition switch to START (III) with the shift lever in or position (A/T) or with the clutch pedal depressed (M/T). The starter should crank the engine.
   A. If the starter does not crank the engine, go to step 3.
   B. If it cranks the engine erratically or too slowly, go to "Check for Wear and Damage" on the next page.
2. Check the battery, battery positive cable, ground, starter cut relay, and the wire connections for looseness and corrosion. Test again.
   If the starter still does not crank the engine, go to step 4.
3. Unplug the connector from the starter.

4. Connect a jumper wire from the battery positive (+) terminal to the solenoid terminal.
   The starter should crank the engine.



   A. If the starter still does not crank the engine, remove it, and diagnose its internal problem.
   B. If the starter cranks the engine, go to step 6.
5. Check the ignition switch (see page EE-14).
6. Check the starter relay (see page EE-47).
7. Check the A/T gear position switch (A/T) or the clutch interlock switch (M/T).
8. Check for an open in the wire between the ignition switch and starter.

If cranking voltage is too low, or current draw too high, check for :

- dead or low battery.
- open circuit in starter armature commutator segments.
- starter armature dragging.
- shorted armature winding.
- excessive drag in engine.

Check Cranking rpm

Engine speed during cranking should be above 100 rpm.

If speed is too low, check for :

- loose battery or starter terminals.
- excessively worn starter brushes.
- open circuit in commutator segments.
- dirty or damaged helical splines or drive gear.
- defective drive gear overrunning clutch.

Check starter disengagement

With the shift lever in N or P position (A/T) or with the clutch pedal depressed (M/T), turn the ignition switch to START(III), and release to ON(II).

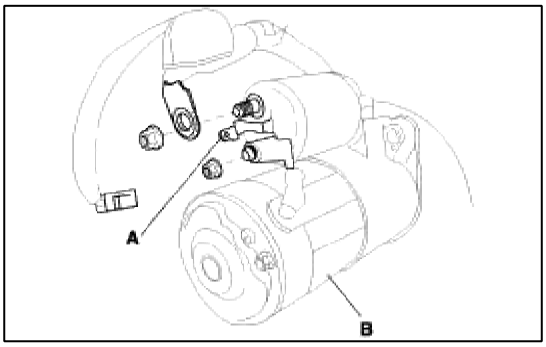
The starter drive gear should disengage from the torque converter ring gear or flywheel ring gear when you release the key.

If the drive gear hangs up on the torque converter ring gear or flywheel ring gear, check for :

- solenoid plunger and switch malfunction.
- dirty drive gear assembly or damaged overrunning clutch.

STARTER SOLENOID TEST

1. Check the hold-in coil for continuity between the S terminal and the armature housing (ground). The coil is OK if there is continuity.

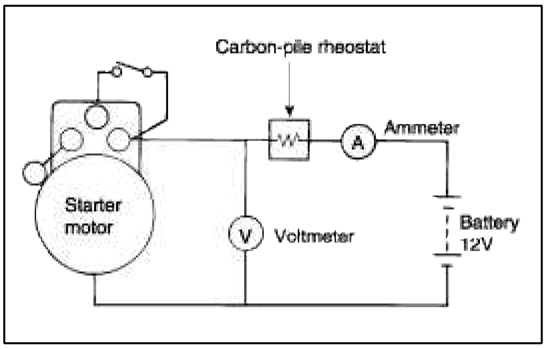


2. Check the pull-in coil for continuity between the S and M terminals. The coil is OK if there is continuity.

FREE RUNNING TEST

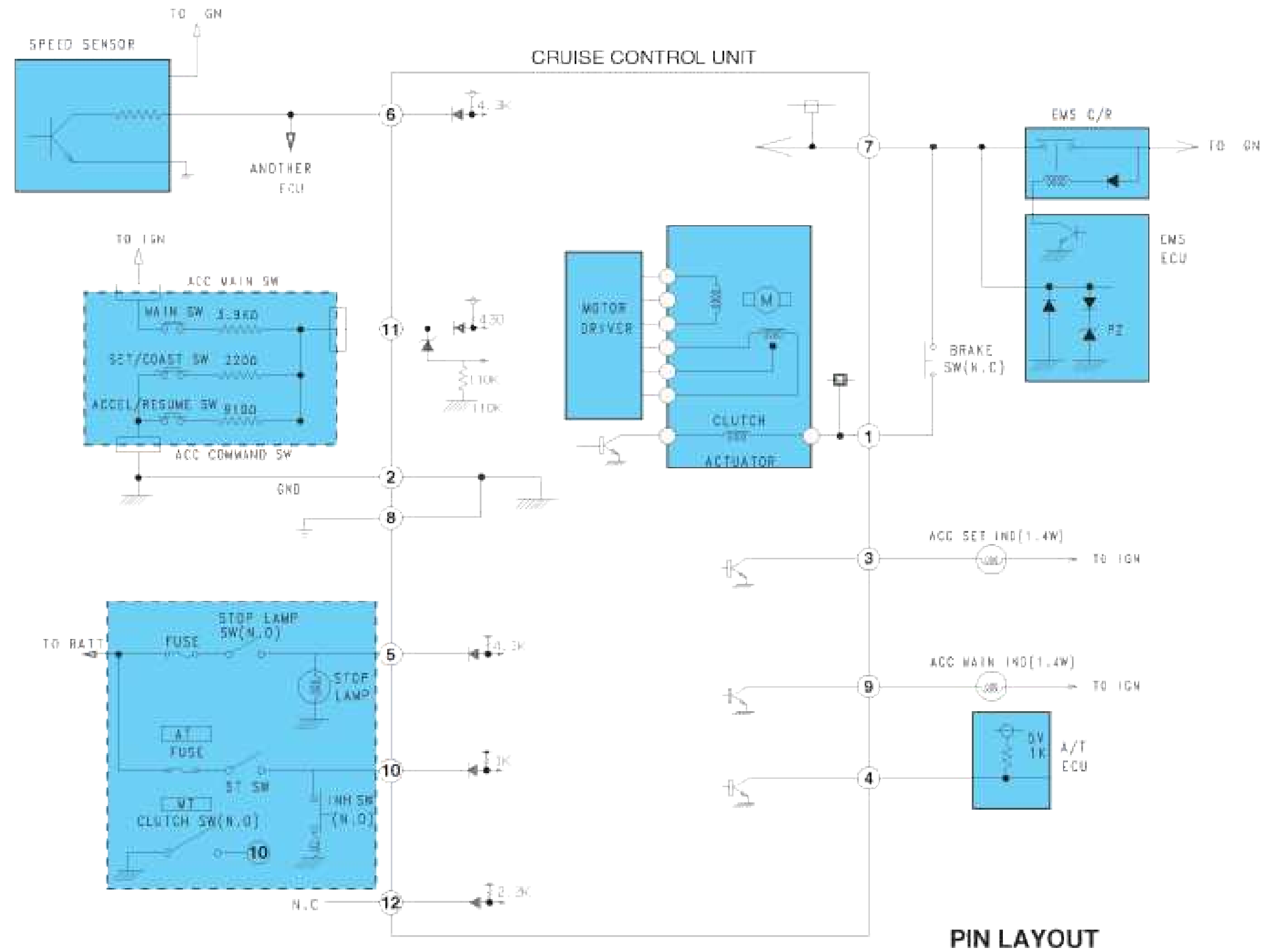
1. Place the starter motor in a vise equipped with soft jaws and connecta fully-charged 12-volt battery to starter motor as follows :
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostatas shown is the illustration.
3. Connect a voltmeter (15-volt scale) across starter motor.
4. Rotate carbon pile to the off position.
5. Connect the battery cable from battery's negative post to the startermotor body.
6. Adjust until battery voltage shown on the voltmeter reads 11 volts.
7. Confirm that the maximum amperage is within the specifications andthat the starter motor turns smoothly and freely :

: Max. 90 Amps
: Min. 2,800 rpm



Engine Electrical System > Cruise Control System > Schematic Diagrams

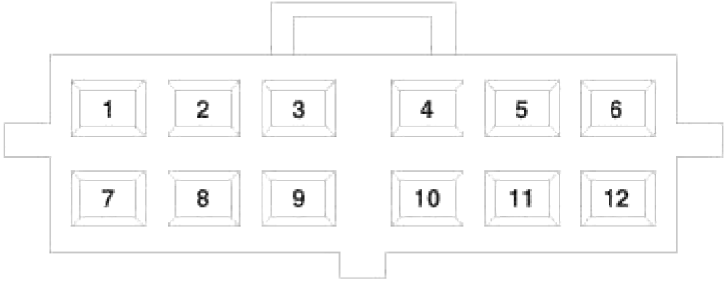
CIRCUIT DIAGRAM FOR CRUISE CONTROL SYSTEM


TO GN
SPEED SENSOR
ANOTHER ECU
CRUISE CONTROL UNIT
4.3K
EMS C/R
TO GN
TO IGN
ACC MAIN SW
MAIN SW
3.9KΩ
SET/COAST SW
220Ω
ACCEL/RESUME SW
910Ω
ACC COMMAND SW
430
110K
MOTOR DRIVER
M
CLUTCH
ACTUATOR
EMS ECU
PZ
BRAKE SW(N.C)
GND
ACC SET IND(1.4W)
TO IGN
ACC MAIN IND(1.4W)
TO IGN
TO BATT
FUSE
STOP LAMP SW(N.O)
STOP LAMP
4.3K
AT FUSE
ST SW
1K
MT CLUTCH SW(N.O)
INH SW (N.O)
5V
1K
A/T ECU
N.C
2.3K
1
2
3
4
5
6
7
8
9
10
11
12

PIN LAYOUT

No	Name	Note
1	BRK	ACTUATOR CLUTCH
2	GND	GROUND
3	SET	SET INDICATOR
4	AT	OD CONTROL
5	STOP	STOP LAMP SW
6	SPD	SPEED SENSOR
7	IGN1	POWER SOURCE
8	GND	GROUND
9	MAIN	MAIN INDICATOR
10	CLU	INH./CLUTCH SW
11	COM	MAIN/COMMAND SW
12	NC	NO CONNECTION

CONNECTOR NO.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2
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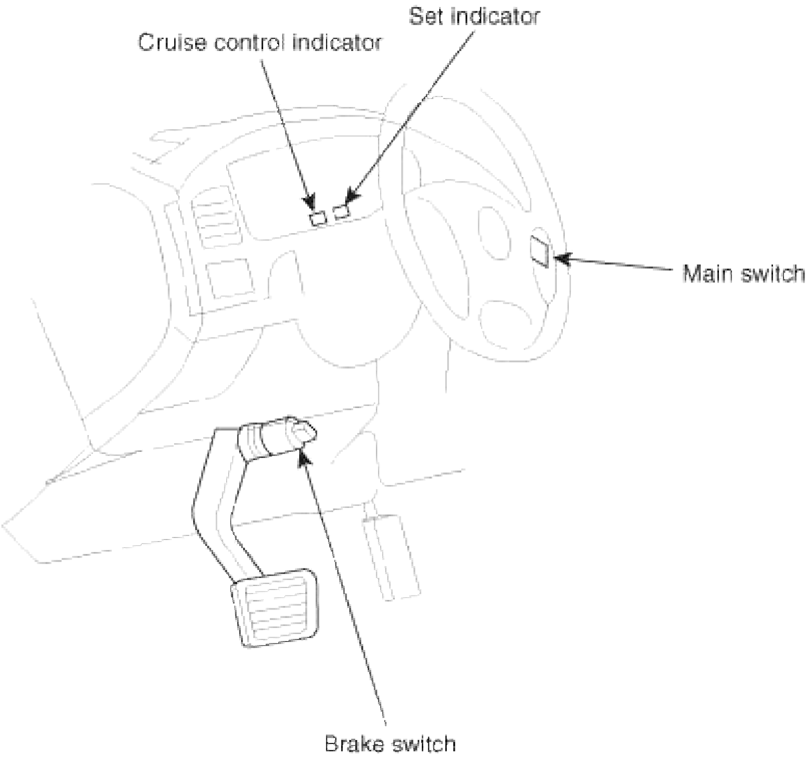
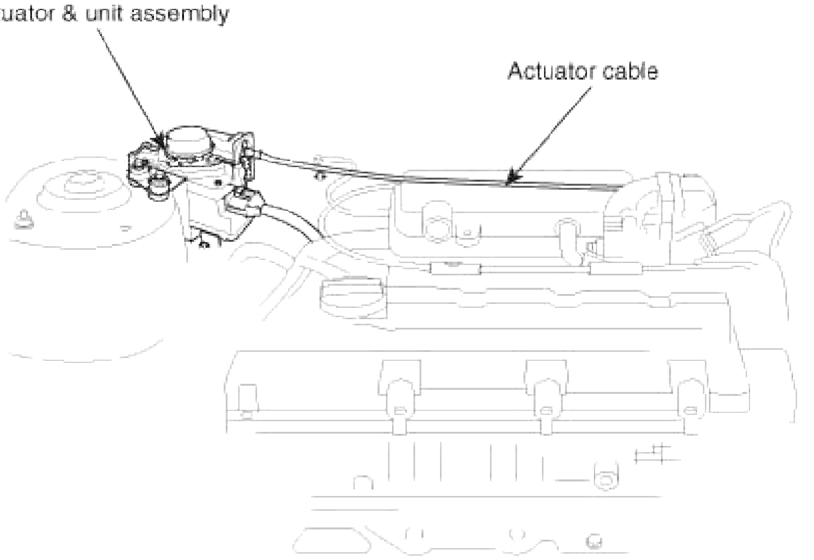
Engine Electrical System > Cruise Control System > Components and Components Location

COMPONENTS LOCATION


Set indicator
Cruise control indicator
Main switch
Brake switch


Actuator & unit assembly
Actuator cable

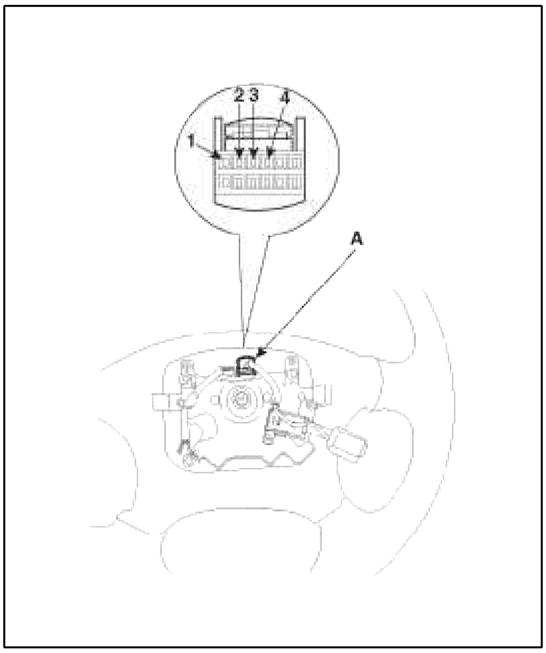
Engine Electrical System > Cruise Control System > Repair procedures

INSPECTION

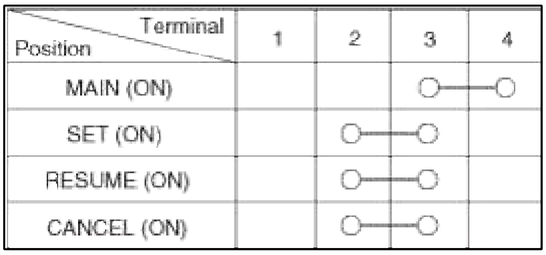
CRUISE REMOCON SWITCH TEST

1. Disconnect the battery negative cable, then disconnect the positive cable, and wait at least three minutes.
2. Remove the driver's airbag (See page RT).

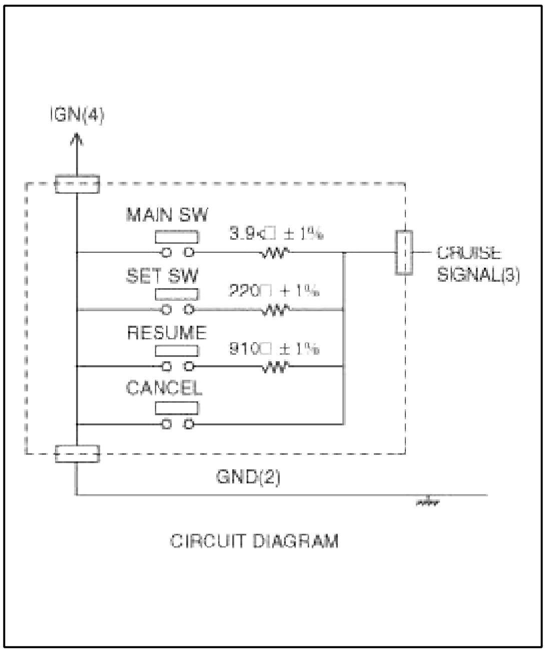
3. Disconnect the remocon switch connector.



4. Check the continuity between the terminals of the connector in each switch position according to the table.
   A. If there is continuity, and it matches the table, the switch is O.K.
   B. If there is no continuity, replace the remocon switch.



Position \ Terminal	1	2	3	4
MAIN (ON)			○	○
SET (ON)		○	○	
RESUME (ON)		○	○	
CANCEL (ON)		○	○	

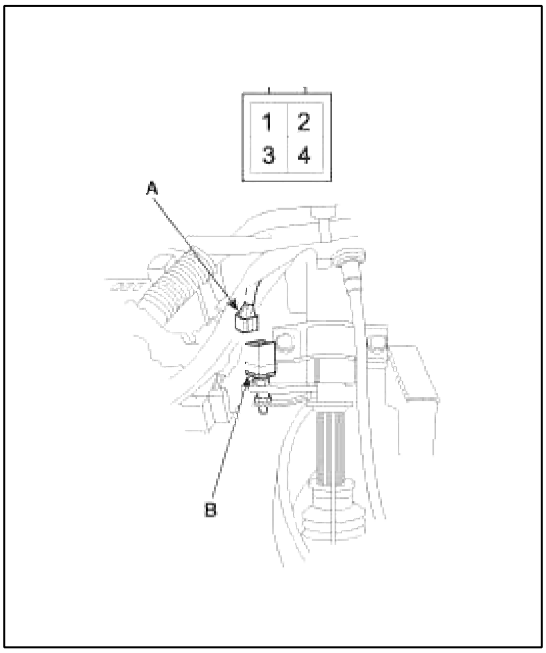

IGN(4)
MAIN SW
3.9kΩ ± 1%
SET SW
220Ω ± 1%
RESUME
910Ω ± 1%
CANCEL
CRUISE SIGNAL(3)
GND(2)

CIRCUIT DIAGRAM

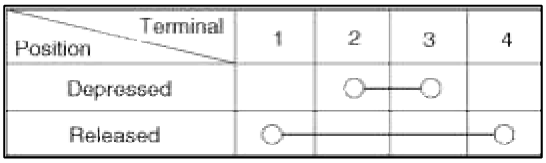
BRAKE SWITCH TEST

1. Disconnect the connector from the brake switch.

2. Remove the brake switch.



3. Check for continuity between the terminals according to the table.

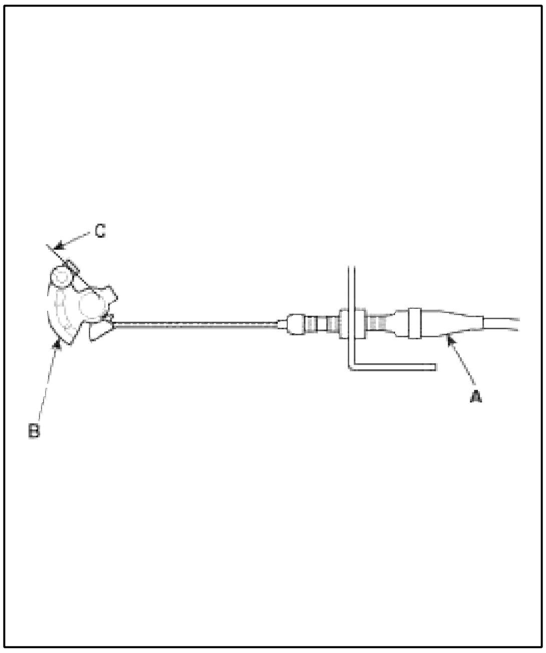


Position \ Terminal	1	2	3	4
Depressed		○	○	
Released	○			○

4. If necessary, replace the switch or adjust the pedal height.

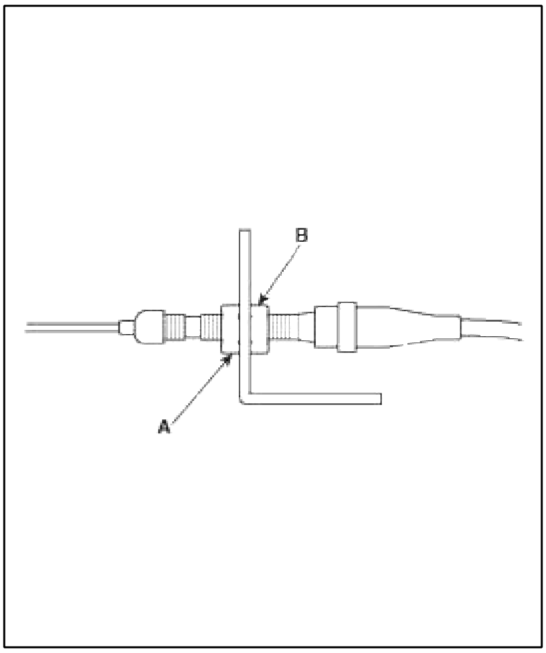
ACTUATOR CABLE ADJUSTMENT

1. Check that the actuator cable (A) moves smoothly with no binding or sticking.

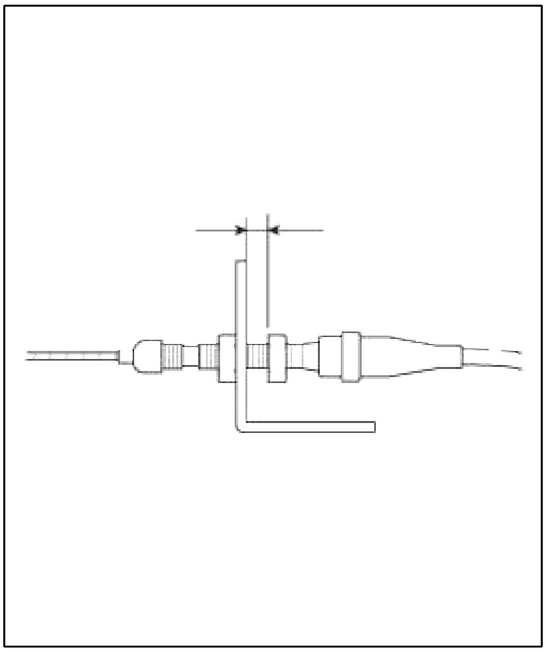


2. position, M/T in neutral) until the radiator fan comes on, then let it idle.
3. Measure the amount of movement of the output linkage (B) until the engine speed starts to increase. At first, the output linkage should be located at the fully closed position (C). The free play (D) should be 3.75±0.5 mm (0.15±0.02 in.)

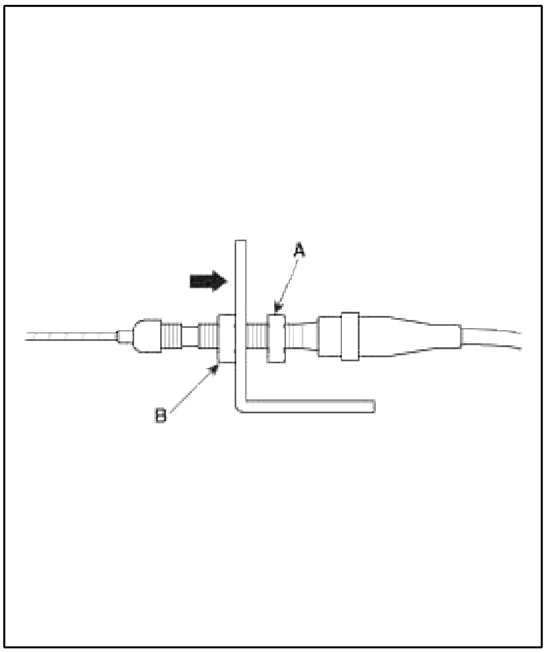
4. If the free play is not within specs, move the cable to the point where the engine speed starts to increase, and tighten the locknut (A) and adjusting nut (B).



5. Turn the adjusting nut (A) until it is 3.75±0.5 mm (0.15±0.02 in.) away from the bracket (B).



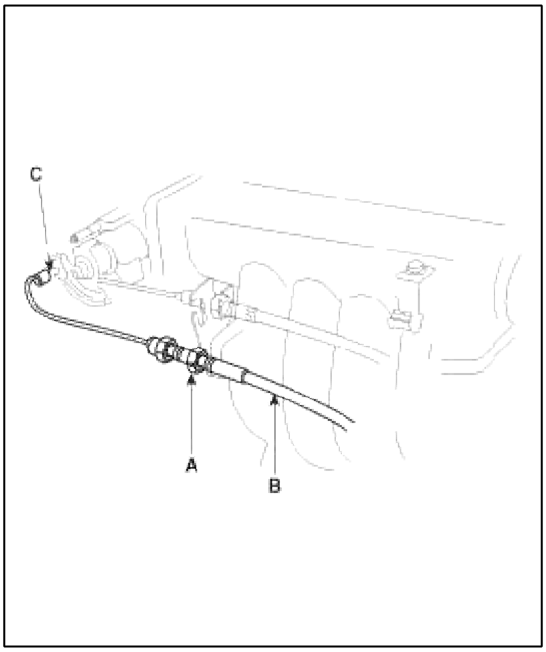
6. Pull the cable so that the adjusting nut (A) touches the bracket, and tighten the locknut (B).



REPLACEMENT

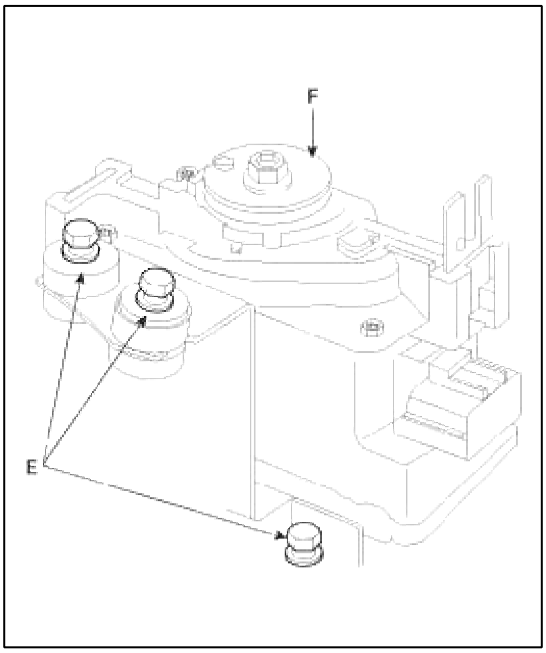
CRUISE CONTROL UNIT AND CABLE

1. Loosen the locknuts(A) and disconnect the actuator cable (B) from the throttle linkage(C).

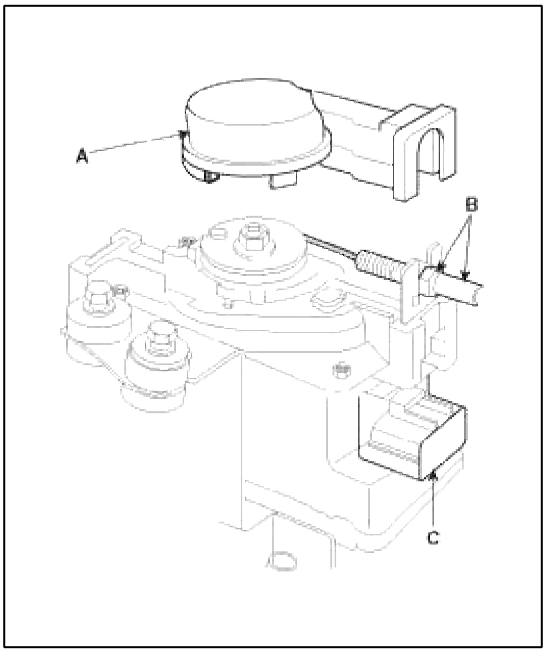


2. Disconnect the cruise control unit connector(D).

3. Loosen the three mounting bolts(E), and remove the cruise control unit with the bracket(F).



4. Loosen the locknuts(A) and disconnect the actuator cable(B) from the cruise control unit.

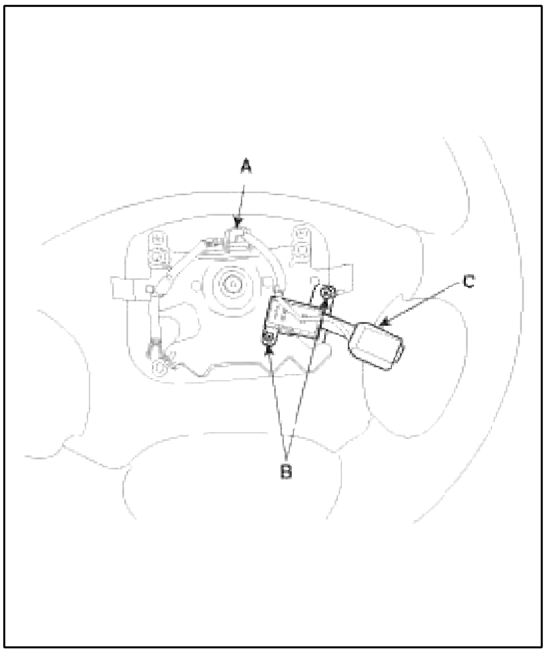


5. Installation is the reverse of removal.

CRUISE REMOCON SWITCH REPLACEMENT

1. Disconnect the battery negative cable, them disconnect the positive cable, and wait at least three minutes.
2. Remove the driver's airbg (See page RT).
3. Disconnect the remocon switch connector(A).

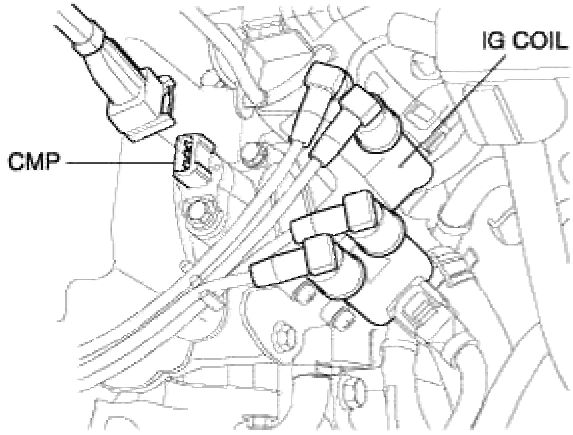
4. Loosen the two mounting screws(B), and remove the cruise remocon switch.



5. Installation is the reverse of removal.
6. Connect the battery positive cable and negative cable to the battery.

Engine Electrical System > Troubleshooting > P0300

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
Monitoring Strategy		● Multiple misfire	● Vacuum leak in air intake system ● CKPS circuit malfunction ● Ignition circuit malfunction ● Faulty ignition coil or pulg wire ● Spark plug malfunction ● Low compression due to blown head gasket, leaking valve or piston ring ● Low/high fuel pressure due to faulty ● pressure regulator,restricted fuel lines,plugged fuel filter or faulty fuel pump ● Fuel injector circuit malfunction ● Faulty fuel injector ● Faulty PCM
case1	Threshold value	● Misfire rate for FTP E/M thresh > 2%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 1000 revs	
Case2	Threshold value	● Misfire rate for catalyst damage > 3.2 ~ 33%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 200 revs	
Fail Safe		● Failed cylinder shut off	

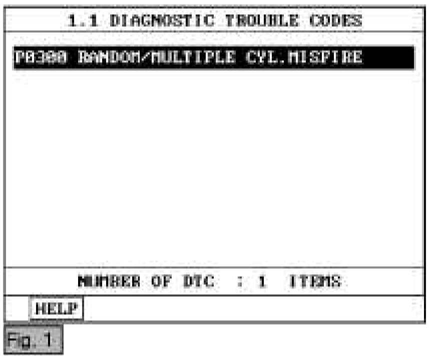
NOTE

If any injectors, HO2S, ECTS, and MAP codes are present, do all repairs associated with those codes before proceeding this troubleshooting guide.

MONITOR DTC STATUS

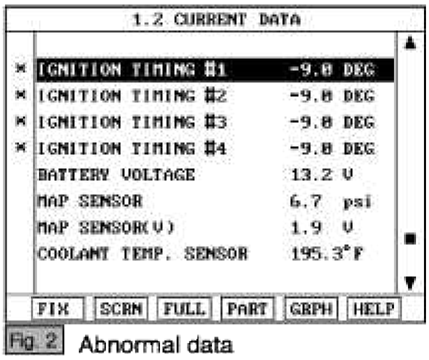
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "ignition timing" parameter on the scantool.



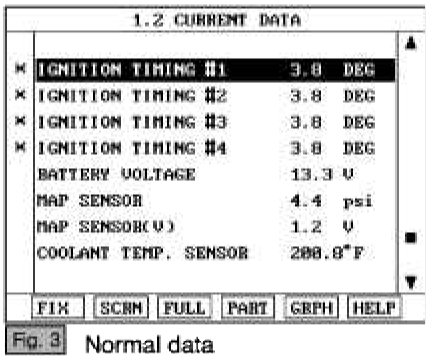
```
1.1 DIAGNOSTIC TROUBLE CODES
P0300 RANDOM/MULTIPLE CYL.MISFIRE

NUMBER OF DTC  : 1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* IGNITION TIMING #1        -9.0 DEG
* IGNITION TIMING #2        -9.0 DEG
* IGNITION TIMING #3        -9.0 DEG
* IGNITION TIMING #4        -9.0 DEG
  BATTERY VOLTAGE           13.2 V
  MAP SENSOR                6.7  psi
  MAP SENSOR(V)             1.9  V
  COOLANT TEMP. SENSOR      195.3°F
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* IGNITION TIMING #1        3.8  DEG
* IGNITION TIMING #2        3.8  DEG
* IGNITION TIMING #3        3.8  DEG
* IGNITION TIMING #4        3.8  DEG
  BATTERY VOLTAGE           13.3 V
  MAP SENSOR                4.4  psi
  MAP SENSOR(V)             1.2  V
  COOLANT TEMP. SENSOR      200.8°F
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification
Idle : 0 ~ 20° BTDC
3000 rpm : 29 ~ 49° BTDC

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

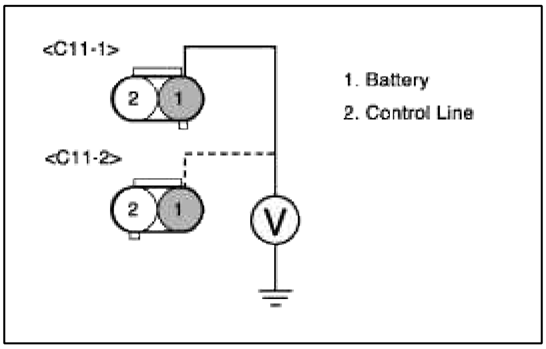
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ignition coil connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

Open or Short circuit to chassis ground between ignition coil harness connector and ignition switch harness connector.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

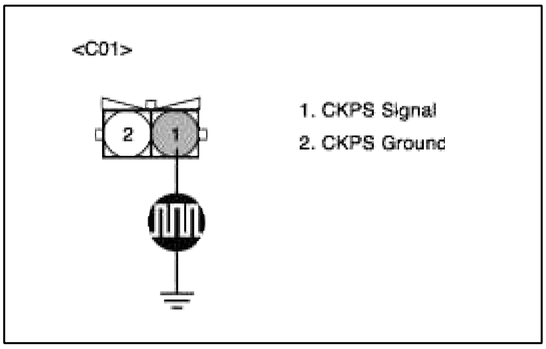
NOTE

In case,when ignition connector is disconnected,the voltage at terminal 1 is 0V.

Possible cause : Open or short circuit of battery line between FUSE 10(10A) of P/C-J/BOX and terminal 1 of ignition coil.

SIGNAL CIRCUIT INSPECTION

1. Check for CKPS signal
   (1) Engine "ON"
   (2) Monitor waveform at the terminal 1 of CKPS.



   (3) Is the wave form displayed normally?

YES

Go to "Component Inspection" procedure.

NO

Go to "P0335 Crankshaft position sensor - no signal" procedure.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

SYSTEM INSPECTION

1. Check for fuel pressure

    (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.

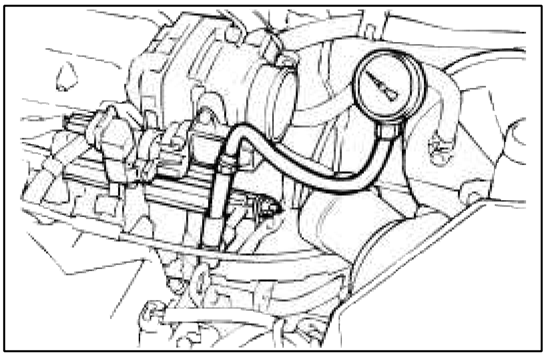
    (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.

    (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.

    (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.

    (5) Start an engine and warm up to operating temperature.

    (6) Check for fuel pressure at idle.



    (7) Is fuel pressure within specification?

YES

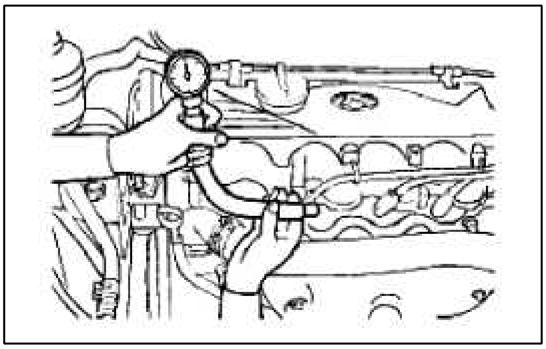
Go to "Compression test " as below.

NO

Check fuel delivery system.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Compression test

    (1) Perform compression test at 300rpm.



    (2) Is fuel pressure within specification?

YES

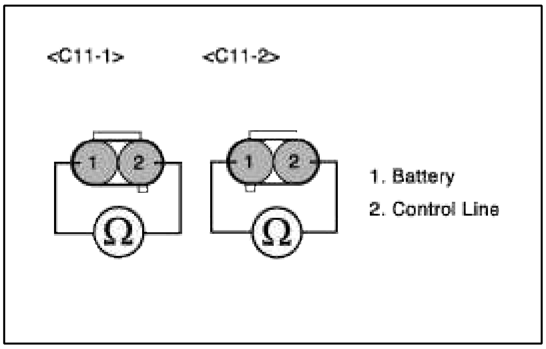
Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Perform leak down test to determine source of low compression.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for ignition coil and plug wires
    - (1) Turn ignition switch to OFF and disconnect ignition coil connector.
    - (2) Check ignition coil and plug wires for cracks or carbon tracing.
    - (3) Check resistance of primary coil.



- (4) Check resistance of secondary coil.
- (5) Check for resistance of plug wires.
- (6) Is the resistance of ignition coils and plug wires within specification?

YES

Go to "Check for spark plug " as below.

NO

Faulty ignition coils or plug wires.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for spark plug

Check the following items below for spark plug.

- (1) Remove spark plugs and check gap and plug condition.
- (2) Check the electrode condition(wear or carbon deposit)
- (3) Check the insulators condition(crack,etc)
- (4) Check the carbon deposit
- (5) Are spark plugs gapped properly and in good condition?

YES

Go to "Check for vacuum and PCV " as below.

NO

Fauity spark plugs.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

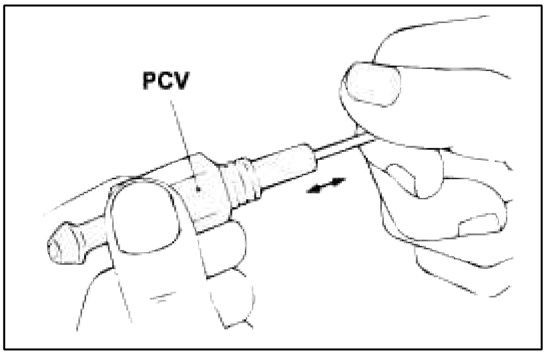
3. Check for vacuum and PCV

Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation.

(1) Remove the positive crankcase ventilation valve.

(2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.

(3) If the plunger does not move,the positive crankcase ventilation valve is clogged.Clean or replace it.



(4) Are vacuum hoses and PCV okay?

YES

Go to "System inspection" procedure.

NO

Replace faulty vacuum hoses or PCV.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

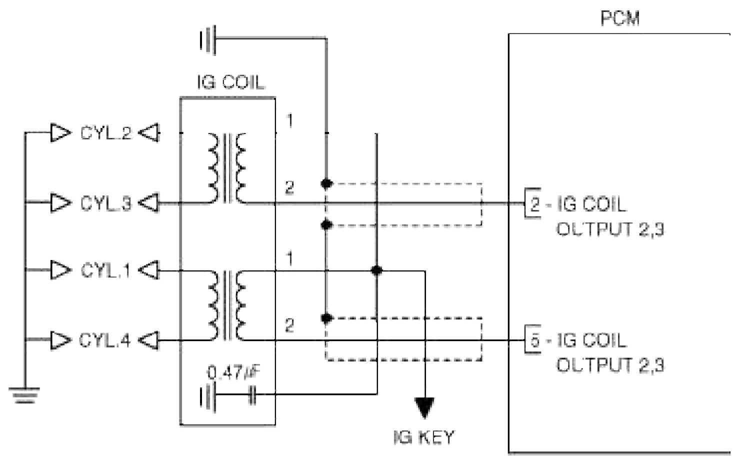
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

[CIRCUIT DIAGRAM]


PCM
IG COIL
CYL.2
CYL.3
CYL.1
CYL.4
1
2
1
2
0.47㎌
2 - IG COIL OUTPUT 2,3
5 - IG COIL OUTPUT 2,3
IG KEY

[CONNECTION INFORMATION]

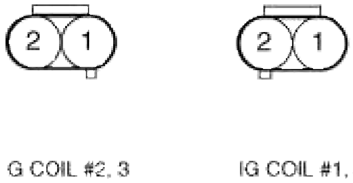
IG COIL #2, 3

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 2	IG Coil control (2,3)

IG COIL #1, 4

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 5	IG Coil control (1,4)

[HARNESS CONNECTORS]

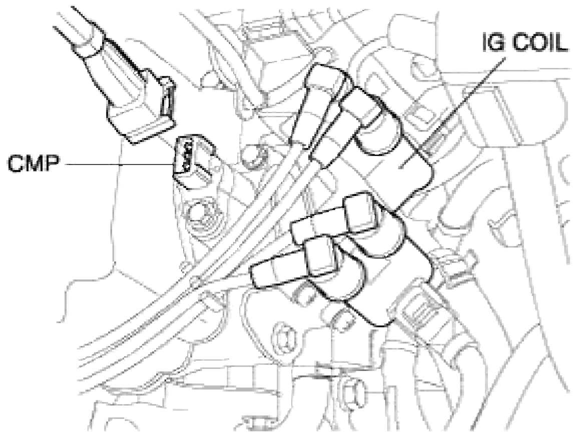

2
1
2
1
G COIL #2, 3
IG COIL #1, 4

1	●	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	●	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Engine Electrical System > Troubleshooting > P0301

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
onitoring Strategy		● Crankshaft speed fiuctuation	● Vacuum leak in air intake system ● CKPS circuit malfunction ● Ignition circuit malfunction ● Faulty ignition coil or pulg wire ● Spark plug malfunction ● Low compression due to blown head gasket, leaking valve or piston ring ● Low/high fuel pressure due to faulty ● pressure regulator,restricted fuel lines,plugged fuel filter or faulty fuel pump ● Fuel injector circuit malfunction ● Faulty fuel injector ● Faulty PCM
case1	Threshold value	● Misfire rate for FTP E/M thresh > 2%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 1000 revs	
Case2	Threshold value	● Misfire rate for catalyst damage > 3.2 ~ 33%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 200 revs	
Fail Safe		● Failed cylinder shut off	

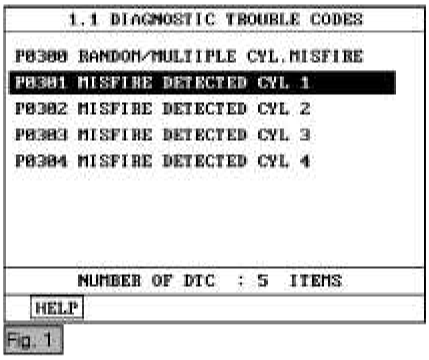
NOTE

If any injectors, HO2S, ECTS, and MAP codes are present, do all repairs associated with those codes before proceeding this troubleshooting guide.

MONITOR DTC STATUS

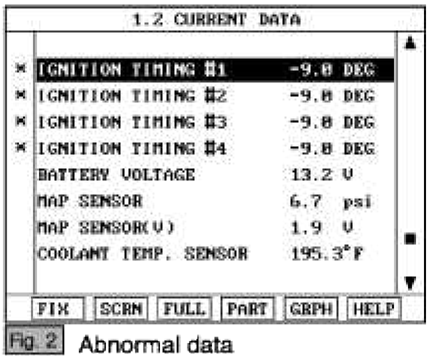
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "ignition timing" parameter on the scantool.



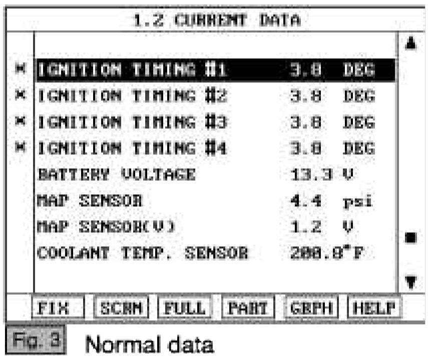
```
1.1 DIAGNOSTIC TROUBLE CODES

P0300 RANDOM/MULTIPLE CYL.MISFIRE
P0301 MISFIRE DETECTED CYL 1
P0302 MISFIRE DETECTED CYL 2
P0303 MISFIRE DETECTED CYL 3
P0304 MISFIRE DETECTED CYL 4

NUMBER OF DTC  : 5  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* IGNITION TIMING #1        -9.0 DEG
* IGNITION TIMING #2        -9.0 DEG
* IGNITION TIMING #3        -9.0 DEG
* IGNITION TIMING #4        -9.0 DEG
  BATTERY VOLTAGE           13.2 V
  MAP SENSOR                6.7  psi
  MAP SENSOR(V)             1.9  V
  COOLANT TEMP. SENSOR      195.3°F
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA

* IGNITION TIMING #1        3.0  DEG
* IGNITION TIMING #2        3.0  DEG
* IGNITION TIMING #3        3.0  DEG
* IGNITION TIMING #4        3.0  DEG
  BATTERY VOLTAGE           13.3 V
  MAP SENSOR                4.4  psi
  MAP SENSOR(V)             1.2  V
  COOLANT TEMP. SENSOR      200.0°F
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification
Idle : 0 ~ 20° BTDC
3000 rpm : 29 ~ 49° BTDC

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

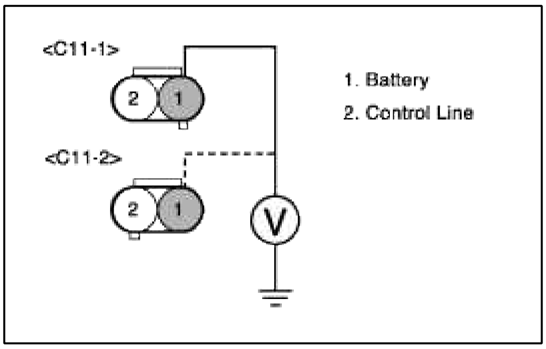
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ignition coil connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

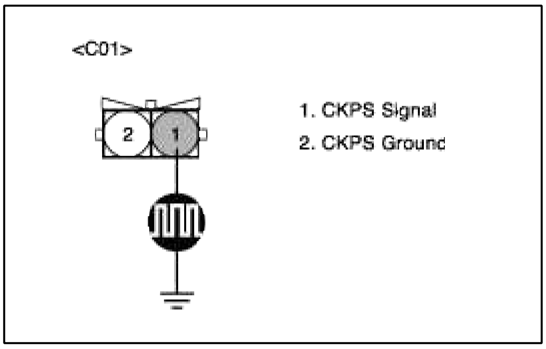
Open or Short circuit to chassis ground between ignition coil harness connector and ignition switch harness connector.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

> **NOTE**
>
> In case,when ignition connector is disconnected,the voltage at terminal 1 is 0V.
>
> Possible cause : Open or short circuit of battery line between FUSE 10(10A) of P/C-J/BOX and terminal 1 of ignition coil.

SIGNAL CIRCUIT INSPECTION

1. Check for CKPS signal
   (1) Engine "ON"
   (2) Monitor waveform at the terminal 1 of CKPS.



(3) Is the wave form displayed normally?

YES

Go to "Component Inspection" procedure.

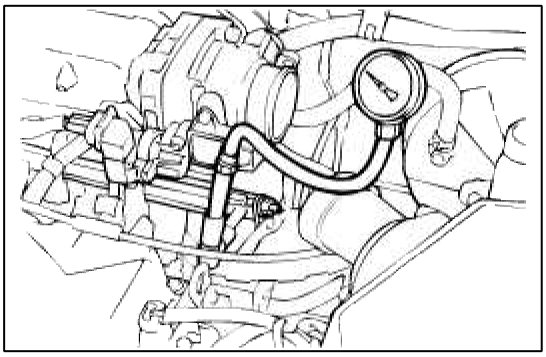
NO

Go to "P0335 Crankshaft position sensor - no signal" procedure.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

SYSTEM INSPECTION

1. Check for fuel pressure
   (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.
   (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.
   (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.
   (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.
   (5) Start an engine and warm up to operating temperature.
   (6) Check for fuel pressure at idle.



   (7) Is fuel pressure within specification?

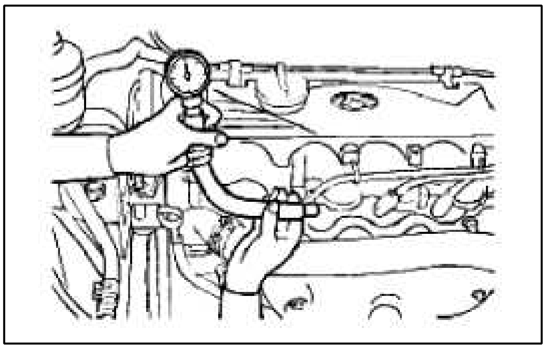
YES

Go to "Compression test " as below.

NO

Check fuel delivery system.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Compression test
   (1) Perform compression test at 300rpm.



   (2) Is fuel pressure within specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

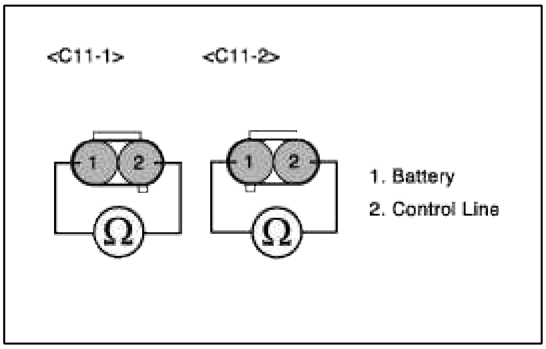
Perform leak down test to determine source of low compression.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for ignition coil and plug wires
   (1) Turn ignition switch to OFF and disconnect ignition coil connector.

   (2) Check ignition coil and plug wires for cracks or carbon tracing.

   (3) Check resistance of primary coil.



   (4) Check resistance of secondary coil.

   (5) Check for resistance of plug wires.

   (6) Is the resistance of ignition coils and plug wires within specification?

YES

Go to "Check for spark plug " as below.

NO

Faulty ignition coils or plug wires.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for spark plug
   Check the following items below for spark plug.
   (1) Remove spark plugs and check gap and plug condition.

   (2) Check the electrode condition(wear or carbon deposit)

   (3) Check the insulators condition(crack,etc)

   (4) Check the carbon deposit

   (5) Are spark plugs gapped properly and in good condition?

YES

Go to "Check for vacuum and PCV " as below.

NO

Fauity spark plugs.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

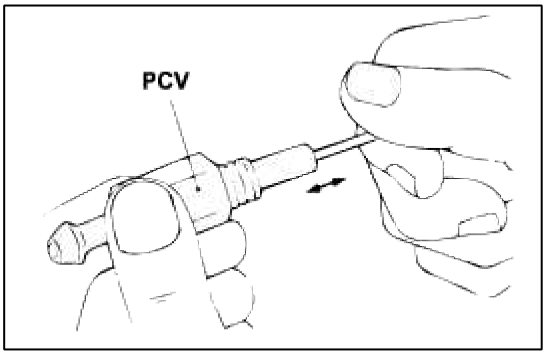
3. Check for vacuum and PCV

Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation.

(1) Remove the positive crankcase ventilation valve.

(2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.

(3) If the plunger does not move,the positive crankcase ventilation valve is clogged.Clean or replace it.



(4) Are vacuum hoses and PCV okay?

YES

Go to "System inspection" procedure.

NO

Replace faulty vacuum hoses or PCV.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

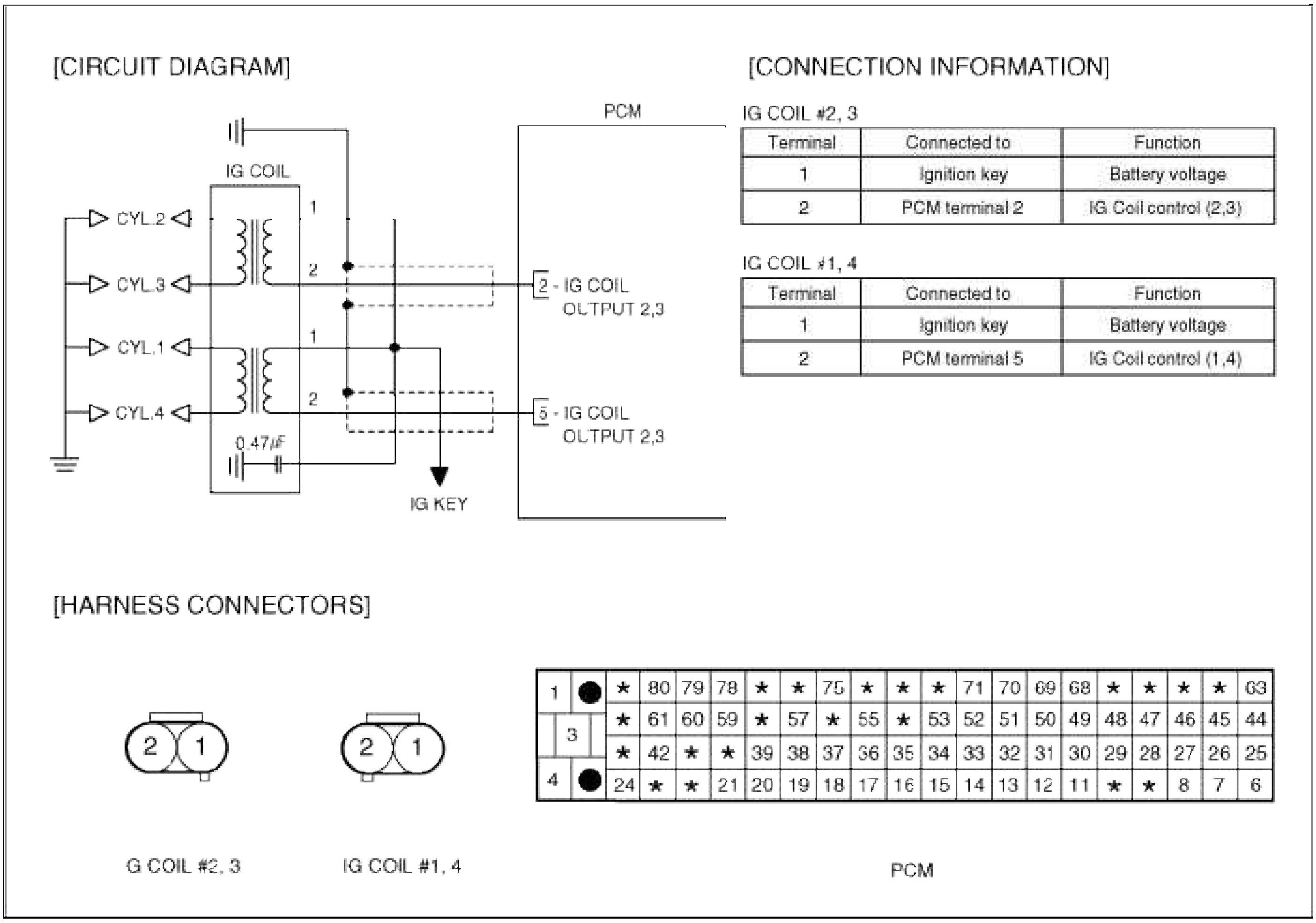
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM



[CIRCUIT DIAGRAM]

PCM
IG COIL
1
2
1
2
CYL.2
CYL.3
CYL.1
CYL.4
0.47μF
IG KEY
2 - IG COIL OUTPUT 2,3
5 - IG COIL OUTPUT 2,3

[CONNECTION INFORMATION]

IG COIL #2, 3

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 2	IG Coil control (2,3)

IG COIL #1, 4

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 5	IG Coil control (1,4)

[HARNESS CONNECTORS]

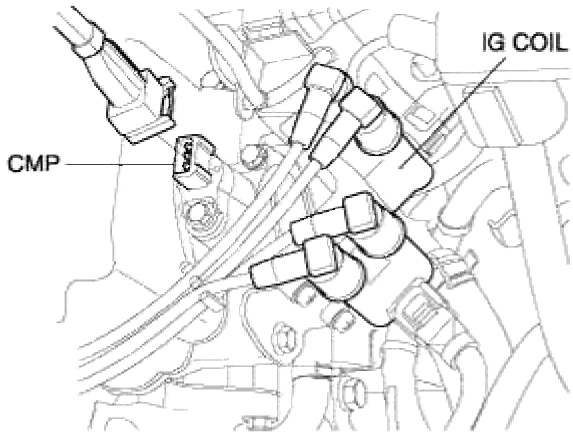
2 1
2 1
G COIL #2, 3
IG COIL #1, 4

1	●	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	●	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Engine Electrical System > Troubleshooting > P0302

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
onitoring Strategy		● Crankshaft speed fiuctuation	● Vacuum leak in air intake system ● CKPS circuit malfunction ● Ignition circuit malfunction ● Faulty ignition coil or pulg wire ● Spark plug malfunction ● Low compression due to blown head gasket, leaking valve or piston ring ● Low/high fuel pressure due to faulty ● pressure regulator,restricted fuel lines,plugged fuel filter or faulty fuel pump ● Fuel injector circuit malfunction ● Faulty fuel injector ● Faulty PCM
case1	Threshold value	● Misfire rate for FTP E/M thresh > 2%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 1000 revs	
Case2	Threshold value	● Misfire rate for catalyst damage > 3.2 ~ 33%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 200 revs	
Fail Safe		● Failed cylinder shut off	

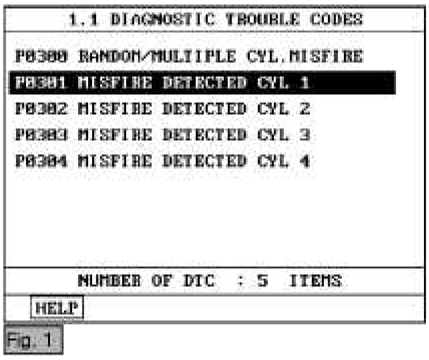
NOTE

If any injectors, HO2S, ECTS, and MAP codes are present, do all repairs associated with those codes before proceeding this troubleshooting guide.

MONITOR DTC STATUS

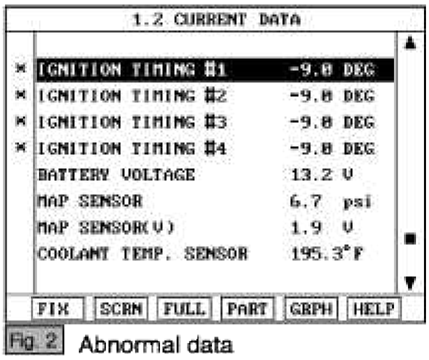
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "ignition timing" parameter on the scantool.



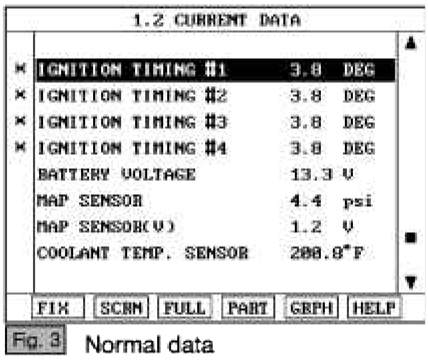
```
1.1 DIAGNOSTIC TROUBLE CODES

P0300 RANDOM/MULTIPLE CYL.MISFIRE
P0301 MISFIRE DETECTED CYL 1
P0302 MISFIRE DETECTED CYL 2
P0303 MISFIRE DETECTED CYL 3
P0304 MISFIRE DETECTED CYL 4

NUMBER OF DTC  : 5  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* IGNITION TIMING #1        -9.0 DEG
* IGNITION TIMING #2        -9.0 DEG
* IGNITION TIMING #3        -9.0 DEG
* IGNITION TIMING #4        -9.0 DEG
  BATTERY VOLTAGE           13.2 V
  MAP SENSOR                6.7  psi
  MAP SENSOR(V)             1.9  V
  COOLANT TEMP. SENSOR      195.3°F
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA

* IGNITION TIMING #1        3.0  DEG
* IGNITION TIMING #2        3.0  DEG
* IGNITION TIMING #3        3.0  DEG
* IGNITION TIMING #4        3.0  DEG
  BATTERY VOLTAGE           13.3 V
  MAP SENSOR                4.4  psi
  MAP SENSOR(V)             1.2  V
  COOLANT TEMP. SENSOR      200.0°F
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification
Idle : 0 ~ 20° BTDC
3000 rpm : 29 ~ 49° BTDC

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

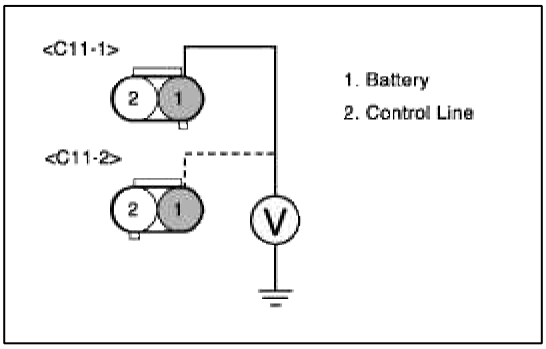
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ignition coil connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

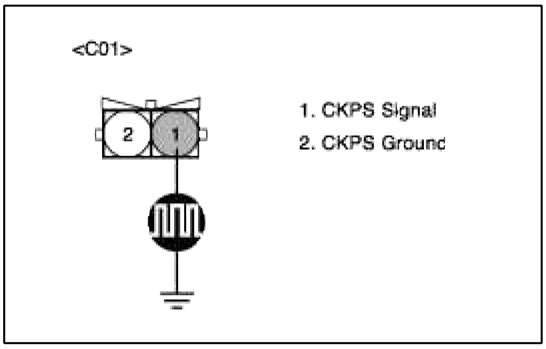
Open or Short circuit to chassis ground between ignition coil harness connector and ignition switch harness connector.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

> **NOTE**
>
> In case,when ignition connector is disconnected,the voltage at terminal 1 is 0V.
>
> Possible cause : Open or short circuit of battery line between FUSE 10(10A) of P/C-J/BOX and terminal 1 of ignition coil.

SIGNAL CIRCUIT INSPECTION

1. Check for CKPS signal
   (1) Engine "ON"
   (2) Monitor waveform at the terminal 1 of CKPS.



   (3) Is the wave form displayed normally?

YES

Go to "Component Inspection" procedure.

NO

Go to "P0335 Crankshaft position sensor - no signal" procedure.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

SYSTEM INSPECTION

1. Check for fuel pressure
   (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.

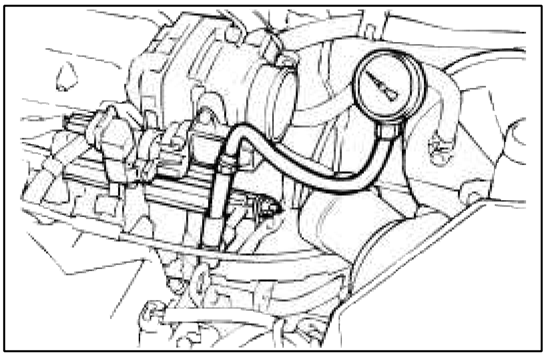
   (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.

   (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.

   (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.

   (5) Start an engine and warm up to operating temperature.

   (6) Check for fuel pressure at idle.



   (7) Is fuel pressure within specification?

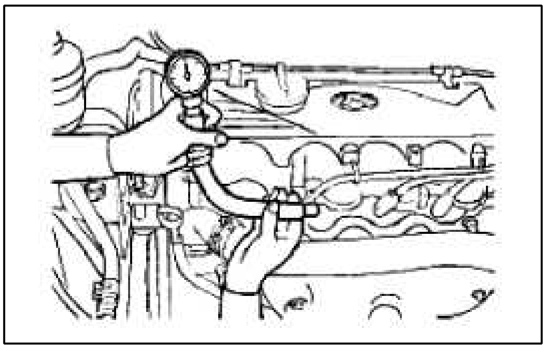
YES

Go to "Compression test " as below.

NO

Check fuel delivery system.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Compression test
   (1) Perform compression test at 300rpm.



   (2) Is fuel pressure within specification?

YES

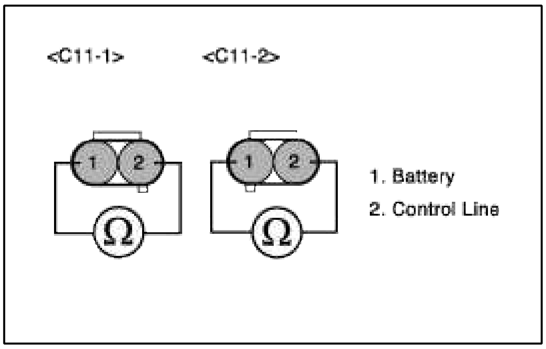
Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Perform leak down test to determine source of low compression.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for ignition coil and plug wires
   (1) Turn ignition switch to OFF and disconnect ignition coil connector.
   (2) Check ignition coil and plug wires for cracks or carbon tracing.
   (3) Check resistance of primary coil.



   (4) Check resistance of secondary coil.
   (5) Check for resistance of plug wires.
   (6) Is the resistance of ignition coils and plug wires within specification?

YES

Go to "Check for spark plug " as below.

NO

Faulty ignition coils or plug wires.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for spark plug
   Check the following items below for spark plug.
   (1) Remove spark plugs and check gap and plug condition.
   (2) Check the electrode condition(wear or carbon deposit)
   (3) Check the insulators condition(crack,etc)
   (4) Check the carbon deposit
   (5) Are spark plugs gapped properly and in good condition?

YES

Go to "Check for vacuum and PCV " as below.

NO

Fauity spark plugs.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

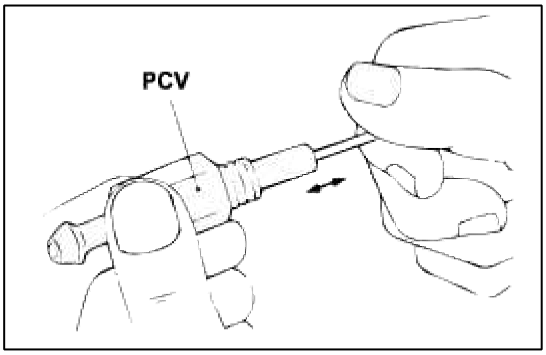
3. Check for vacuum and PCV

Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation.

(1) Remove the positive crankcase ventilation valve.

(2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.

(3) If the plunger does not move,the positive crankcase ventilation valve is clogged.Clean or replace it.



(4) Are vacuum hoses and PCV okay?

YES

Go to "System inspection" procedure.

NO

Replace faulty vacuum hoses or PCV.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

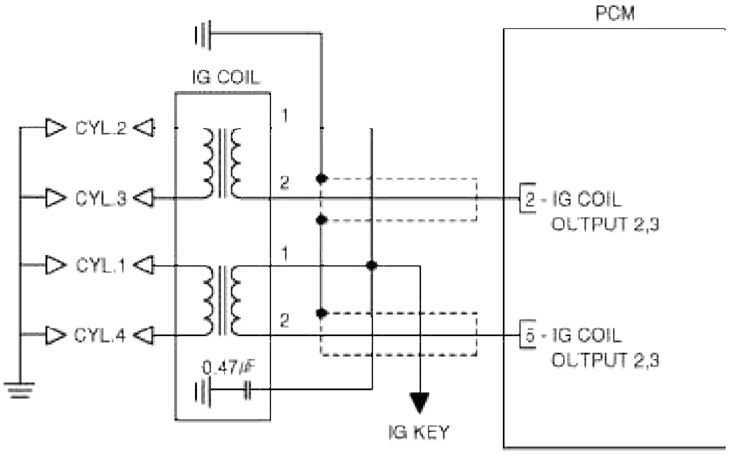
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

[CIRCUIT DIAGRAM]


PCM
IG COIL
1
2
1
2
CYL.2
CYL.3
CYL.1
CYL.4
0.47μF
2 - IG COIL OUTPUT 2,3
5 - IG COIL OUTPUT 2,3
IG KEY

[CONNECTION INFORMATION]

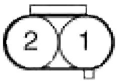
IG COIL #2, 3

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 2	IG Coil control (2,3)

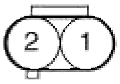
IG COIL #1, 4

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 5	IG Coil control (1,4)

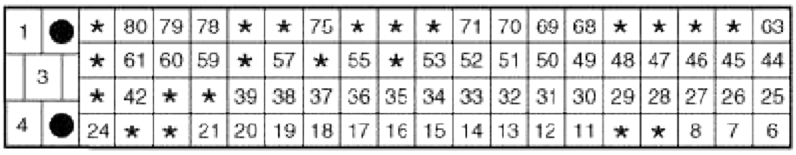
[HARNESS CONNECTORS]



G COIL #2, 3



IG COIL #1, 4

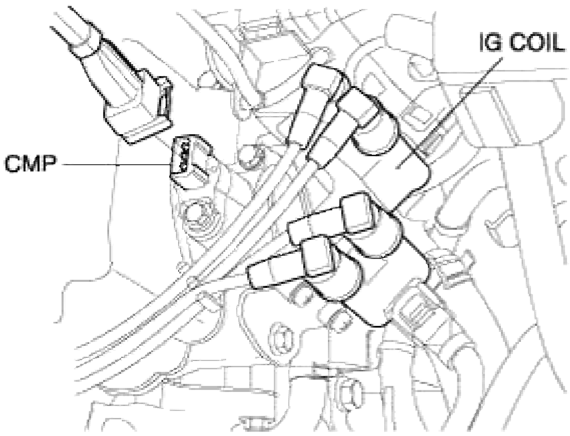


1	●	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	●	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Engine Electrical System > Troubleshooting > P0303

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
onitoring Strategy		● Crankshaft speed fiuctuation	● Vacuum leak in air intake system ● CKPS circuit malfunction ● Ignition circuit malfunction ● Faulty ignition coil or pulg wire ● Spark plug malfunction ● Low compression due to blown head gasket, leaking valve or piston ring ● Low/high fuel pressure due to faulty ● pressure regulator,restricted fuel lines,plugged fuel filter or faulty fuel pump ● Fuel injector circuit malfunction ● Faulty fuel injector ● Faulty PCM
case1	Threshold value	● Misfire rate for FTP E/M thresh > 2%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 1000 revs	
Case2	Threshold value	● Misfire rate for catalyst damage > 3.2 ~ 33%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 200 revs	
Fail Safe		● Failed cylinder shut off	

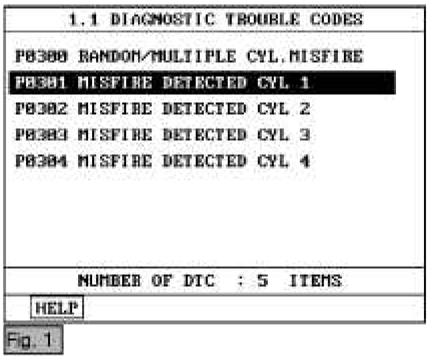
NOTE

If any injectors, HO2S, ECTS, and MAP codes are present, do all repairs associated with those codes before proceeding this troubleshooting guide.

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "ignition timing" parameter on the scantool.

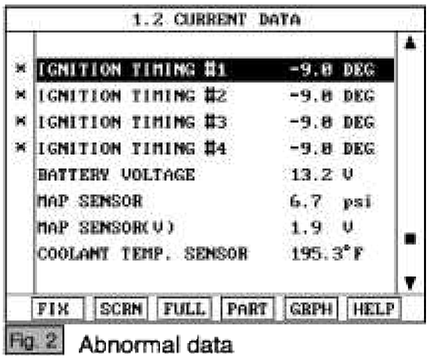


1.1 DIAGNOSTIC TROUBLE CODES

P0300 RANDOM/MULTIPLE CYL.MISFIRE
P0301 MISFIRE DETECTED CYL 1
P0302 MISFIRE DETECTED CYL 2
P0303 MISFIRE DETECTED CYL 3
P0304 MISFIRE DETECTED CYL 4

NUMBER OF DTC : 5 ITEMS

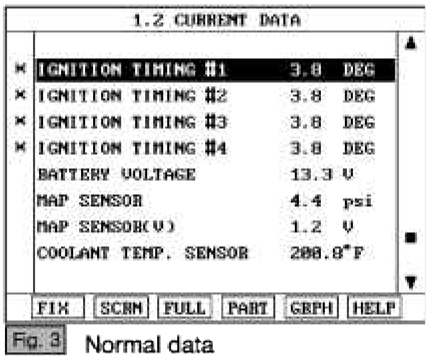
Fig. 1



1.2 CURRENT DATA

×	IGNITION TIMING #1	-9.0 DEG
×	IGNITION TIMING #2	-9.0 DEG
×	IGNITION TIMING #3	-9.0 DEG
×	IGNITION TIMING #4	-9.0 DEG
	BATTERY VOLTAGE	13.2 V
	MAP SENSOR	6.7 psi
	MAP SENSOR(V)	1.9 V
	COOLANT TEMP. SENSOR	195.3°F

Fig. 2 Abnormal data



1.2 CURRENT DATA

×	IGNITION TIMING #1	3.0 DEG
×	IGNITION TIMING #2	3.0 DEG
×	IGNITION TIMING #3	3.0 DEG
×	IGNITION TIMING #4	3.0 DEG
	BATTERY VOLTAGE	13.3 V
	MAP SENSOR	4.4 psi
	MAP SENSOR(V)	1.2 V
	COOLANT TEMP. SENSOR	200.0°F

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification
Idle : 0 ~ 20° BTDC
3000 rpm : 29 ~ 49° BTDC

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

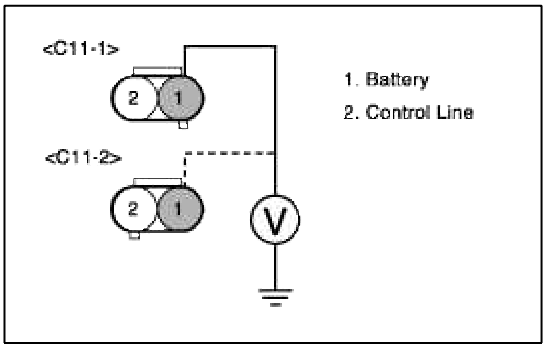
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ignition coil connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

Open or Short circuit to chassis ground between ignition coil harness connector and ignition switch harness connector.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

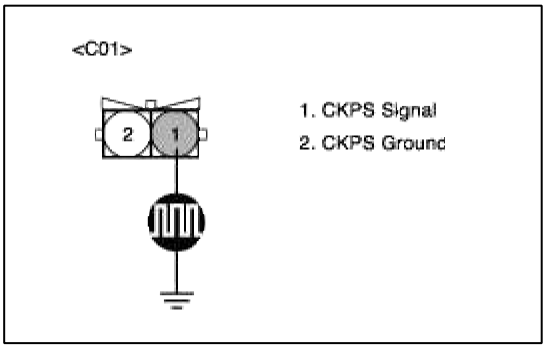
NOTE

In case,when ignition connector is disconnected,the voltage at terminal 1 is 0V.

Possible cause : Open or short circuit of battery line between FUSE 10(10A) of P/C-J/BOX and terminal 1 of ignition coil.

SIGNAL CIRCUIT INSPECTION

1. Check for CKPS signal
   (1) Engine "ON"
   (2) Monitor waveform at the terminal 1 of CKPS.



   (3) Is the wave form displayed normally?

YES

Go to "Component Inspection" procedure.

NO

Go to "P0335 Crankshaft position sensor - no signal" procedure.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

SYSTEM INSPECTION

1. Check for fuel pressure
    (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.

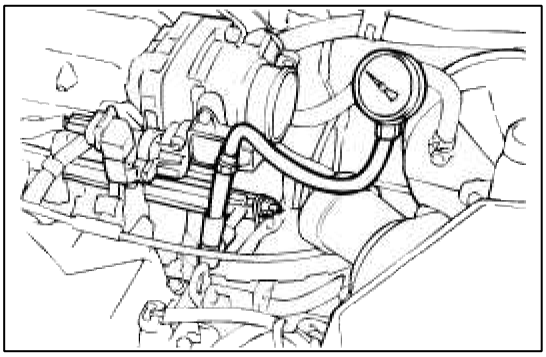
    (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.

    (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.

    (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.

    (5) Start an engine and warm up to operating temperature.

    (6) Check for fuel pressure at idle.



    (7) Is fuel pressure within specification?

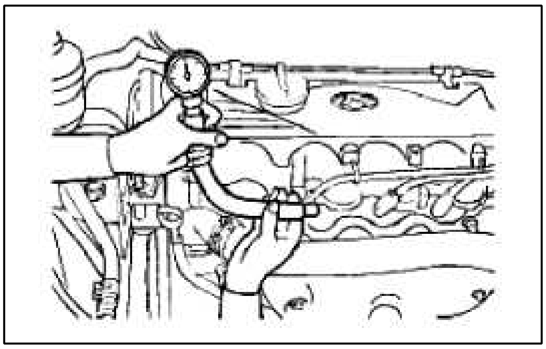
YES

Go to "Compression test " as below.

NO

Check fuel delivery system.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Compression test
    (1) Perform compression test at 300rpm.



    (2) Is fuel pressure within specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

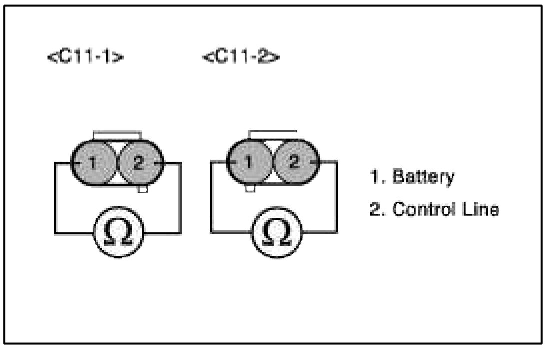
Perform leak down test to determine source of low compression.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for ignition coil and plug wires
   (1) Turn ignition switch to OFF and disconnect ignition coil connector.

   (2) Check ignition coil and plug wires for cracks or carbon tracing.

   (3) Check resistance of primary coil.



   (4) Check resistance of secondary coil.

   (5) Check for resistance of plug wires.

   (6) Is the resistance of ignition coils and plug wires within specification?

YES

Go to "Check for spark plug " as below.

NO

Faulty ignition coils or plug wires.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for spark plug
   Check the following items below for spark plug.
   (1) Remove spark plugs and check gap and plug condition.

   (2) Check the electrode condition(wear or carbon deposit)

   (3) Check the insulators condition(crack,etc)

   (4) Check the carbon deposit

   (5) Are spark plugs gapped properly and in good condition?

YES

Go to "Check for vacuum and PCV " as below.

NO

Fauity spark plugs.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

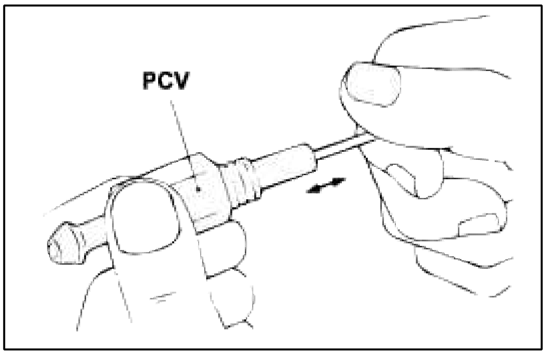
3. Check for vacuum and PCV

Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation.

(1) Remove the positive crankcase ventilation valve.

(2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.

(3) If the plunger does not move,the positive crankcase ventilation valve is clogged.Clean or replace it.



(4) Are vacuum hoses and PCV okay?

YES

Go to "System inspection" procedure.

NO

Replace faulty vacuum hoses or PCV.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

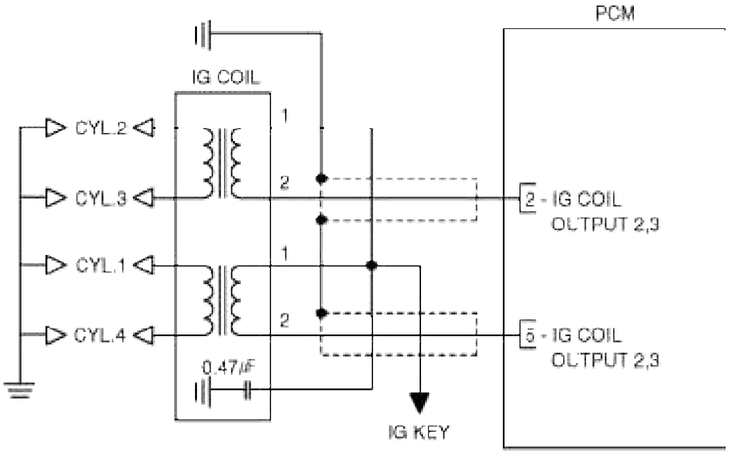
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

[CIRCUIT DIAGRAM]


PCM
IG COIL
1
2
1
2
CYL.2
CYL.3
CYL.1
CYL.4
0.47μF
IG KEY
2 - IG COIL OUTPUT 2,3
5 - IG COIL OUTPUT 2,3

[CONNECTION INFORMATION]

IG COIL #2, 3

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 2	IG Coil control (2,3)

IG COIL #1, 4

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 5	IG Coil control (1,4)

[HARNESS CONNECTORS]

G COIL #2, 3 IG COIL #1, 4

1	●	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	●	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

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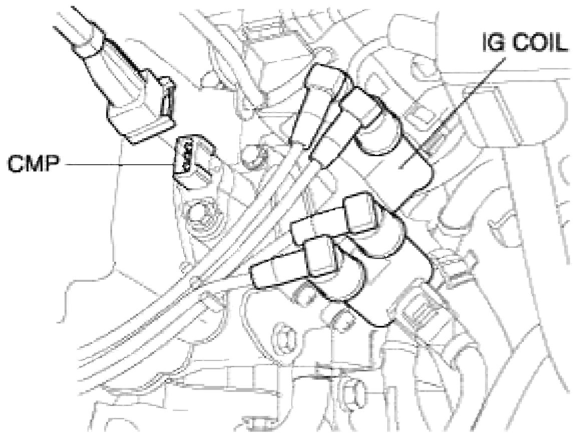
COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
onitoring Strategy		● Crankshaft speed fluctuation	● Vacuum leak in air intake system ● CKPS circuit malfunction ● Ignition circuit malfunction ● Faulty ignition coil or pulg wire ● Spark plug malfunction ● Low compression due to blown head gasket, leaking valve or piston ring ● Low/high fuel pressure due to faulty ● pressure regulator,restricted fuel lines,plugged fuel filter or faulty fuel pump ● Fuel injector circuit malfunction ● Faulty fuel injector ● Faulty PCM
case1	Threshold value	● Misfire rate for FTP E/M thresh > 2%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 1000 revs	
Case2	Threshold value	● Misfire rate for catalyst damage > 3.2 ~ 33%	
	Enable Conditions	● Engine speed 360-6240 rpm ● Engine load > Zero torq. ● Eng. load change < 7-357%/seg ● Eng. speed change < 1580 rpm/s ● No rough load < 0.3g ● 0 sec after engine start ● Intake air temperature > -30 degC (-22 °F)	
	Diagnostic Time	● 200 revs	
Fail Safe		● Failed cylinder shut off	

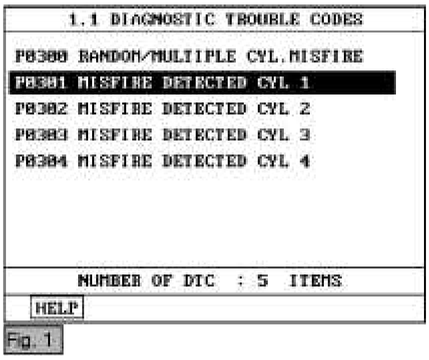
NOTE

If any injectors, HO2S, ECTS, and MAP codes are present, do all repairs associated with those codes before proceeding this troubleshooting guide.

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "ignition timing" parameter on the scantool.

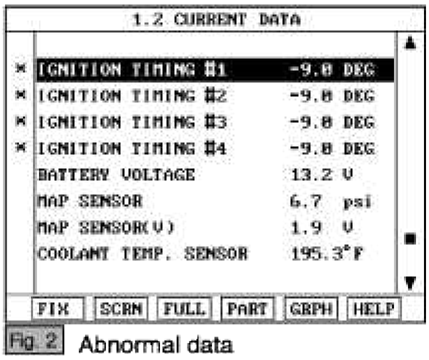


```
1.1 DIAGNOSTIC TROUBLE CODES

P0300 RANDOM/MULTIPLE CYL.MISFIRE
P0301 MISFIRE DETECTED CYL 1
P0302 MISFIRE DETECTED CYL 2
P0303 MISFIRE DETECTED CYL 3
P0304 MISFIRE DETECTED CYL 4

NUMBER OF DTC  : 5  ITEMS
```

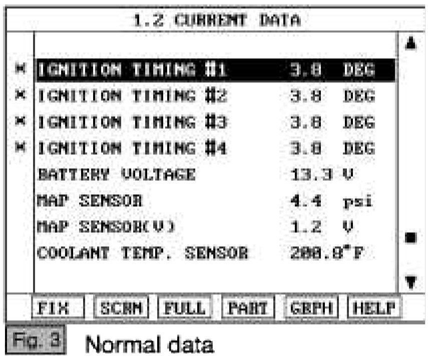
Fig. 1



```
1.2 CURRENT DATA

* IGNITION TIMING #1       -9.0 DEG
* IGNITION TIMING #2       -9.0 DEG
* IGNITION TIMING #3       -9.0 DEG
* IGNITION TIMING #4       -9.0 DEG
  BATTERY VOLTAGE          13.2 V
  MAP SENSOR               6.7  psi
  MAP SENSOR(V)            1.9  V
  COOLANT TEMP. SENSOR     195.3°F
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA

* IGNITION TIMING #1       3.8  DEG
* IGNITION TIMING #2       3.8  DEG
* IGNITION TIMING #3       3.8  DEG
* IGNITION TIMING #4       3.8  DEG
  BATTERY VOLTAGE          13.3 V
  MAP SENSOR               4.4  psi
  MAP SENSOR(V)            1.2  V
  COOLANT TEMP. SENSOR     200.0°F
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification
Idle : 0 ~ 20° BTDC
3000 rpm : 29 ~ 49° BTDC

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

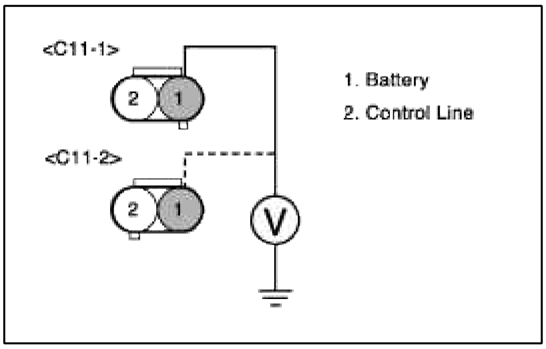
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ignition coil connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

Open or Short circuit to chassis ground between ignition coil harness connector and ignition switch harness connector.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

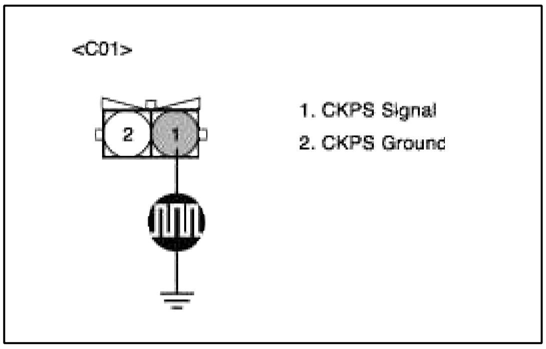
NOTE

In case,when ignition connector is disconnected,the voltage at terminal 1 is 0V.

Possible cause : Open or short circuit of battery line between FUSE 10(10A) of P/C-J/BOX and terminal 1 of ignition coil.

SIGNAL CIRCUIT INSPECTION

1. Check for CKPS signal
   (1) Engine "ON"
   (2) Monitor waveform at the terminal 1 of CKPS.



(3) Is the wave form displayed normally?

YES

Go to "Component Inspection" procedure.

NO

Go to "P0335 Crankshaft position sensor - no signal" procedure.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

SYSTEM INSPECTION

1. Check for fuel pressure
   (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.

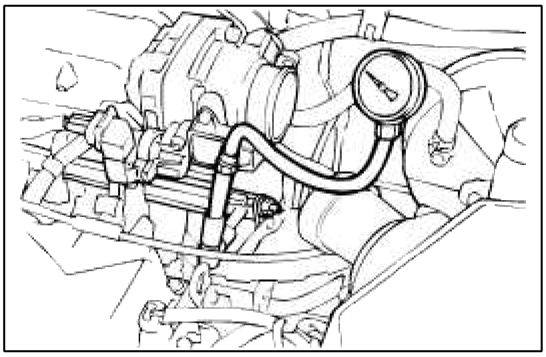
   (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.

   (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.

   (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.

   (5) Start an engine and warm up to operating temperature.

   (6) Check for fuel pressure at idle.



   (7) Is fuel pressure within specification?

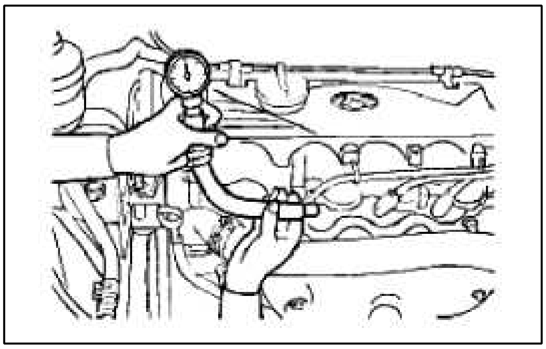
YES

Go to "Compression test " as below.

NO

Check fuel delivery system.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Compression test
   (1) Perform compression test at 300rpm.



   (2) Is fuel pressure within specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

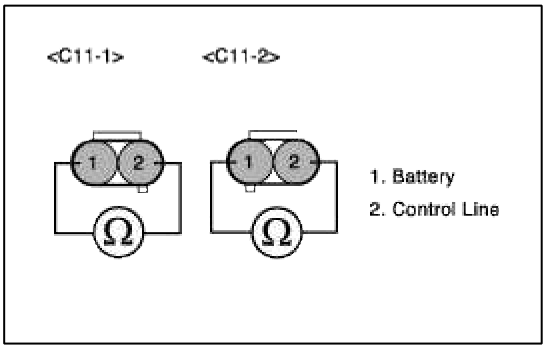
Perform leak down test to determine source of low compression.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for ignition coil and plug wires
   (1) Turn ignition switch to OFF and disconnect ignition coil connector.

   (2) Check ignition coil and plug wires for cracks or carbon tracing.

   (3) Check resistance of primary coil.



   (4) Check resistance of secondary coil.

   (5) Check for resistance of plug wires.

   (6) Is the resistance of ignition coils and plug wires within specification?

YES

Go to "Check for spark plug " as below.

NO

Faulty ignition coils or plug wires.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for spark plug
   Check the following items below for spark plug.
   (1) Remove spark plugs and check gap and plug condition.

   (2) Check the electrode condition(wear or carbon deposit)

   (3) Check the insulators condition(crack,etc)

   (4) Check the carbon deposit

   (5) Are spark plugs gapped properly and in good condition?

YES

Go to "Check for vacuum and PCV " as below.

NO

Fauity spark plugs.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

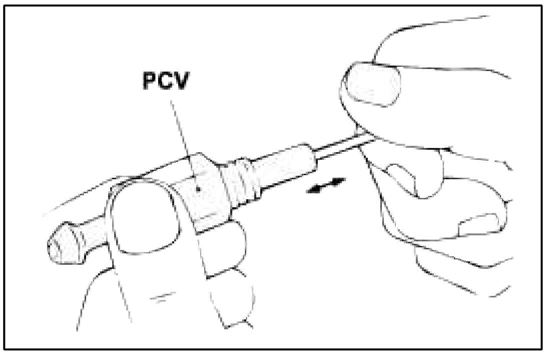
3. Check for vacuum and PCV

Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation.

(1) Remove the positive crankcase ventilation valve.

(2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.

(3) If the plunger does not move,the positive crankcase ventilation valve is clogged.Clean or replace it.



(4) Are vacuum hoses and PCV okay?

YES

Go to "System inspection" procedure.

NO

Replace faulty vacuum hoses or PCV.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

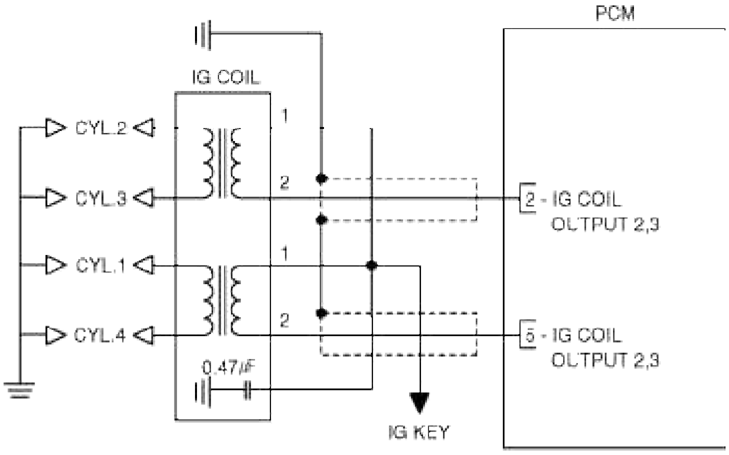
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

[CIRCUIT DIAGRAM]


PCM
IG COIL
CYL.2
CYL.3
CYL.1
CYL.4
1
2
1
2
0.47μF
IG KEY
2 - IG COIL OUTPUT 2,3
5 - IG COIL OUTPUT 2,3

[CONNECTION INFORMATION]

IG COIL #2, 3

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 2	IG Coil control (2,3)

IG COIL #1, 4

Terminal	Connected to	Function
1	Ignition key	Battery voltage
2	PCM terminal 5	IG Coil control (1,4)

[HARNESS CONNECTORS]

G COIL #2, 3

IG COIL #1, 4

1	●	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	●	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

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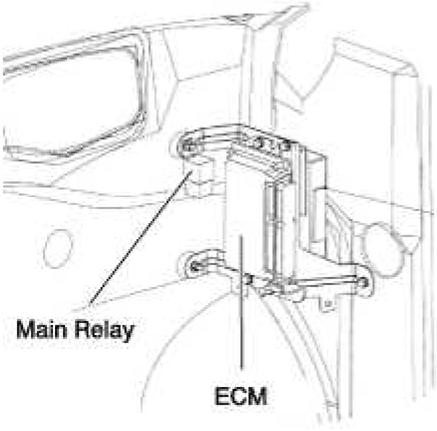
COMPONENT INSPECTION


Main Relay
ECM

GENERAL DESCTIPTION

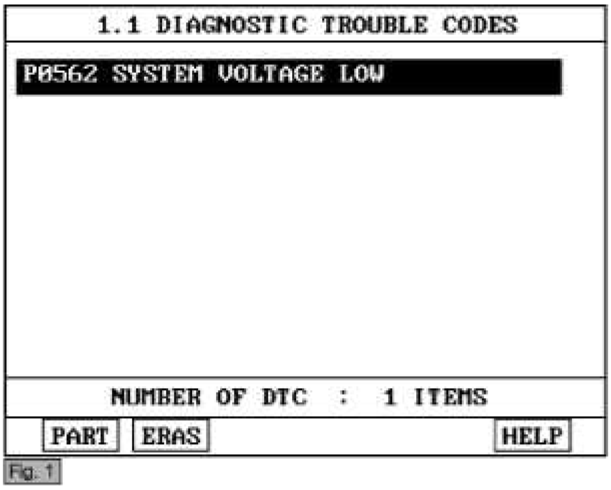
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check Low	● Open in control circuit (pin 14) ● Charging system ● Faulty PCM
Threshold value	● Voltage : < 10V	
Enable Conditions	● 120 sec after engine start	
Diagnostic Time	● 0.2 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Battery voltage" parameter on the scantool.

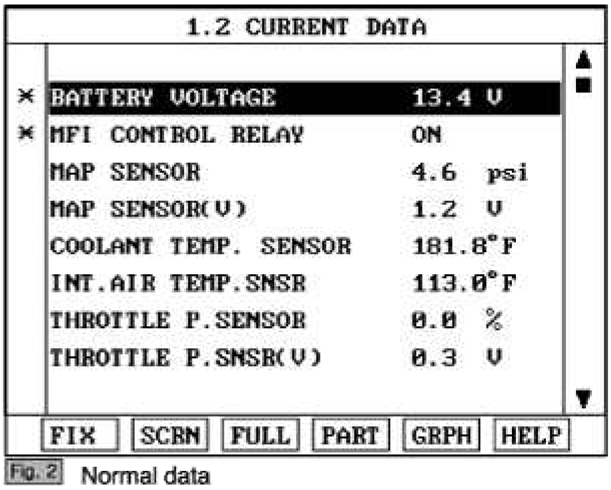


1.1 DIAGNOSTIC TROUBLE CODES

P0562 SYSTEM VOLTAGE LOW

NUMBER OF DTC : 1 ITEMS

Fig. 1



1.2 CURRENT DATA

```
* BATTERY VOLTAGE          13.4 V
* MFI CONTROL RELAY        ON
  MAP SENSOR               4.6  psi
  MAP SENSOR(V)            1.2  V
  COOLANT TEMP. SENSOR     181.8°F
  INT.AIR TEMP.SNSR        113.0°F
  THROTTLE P.SENSOR        0.0  %
  THROTTLE P.SNSR(V)       0.3  V
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification

Engine stop : 11 ~ 13V

Idle : 12 ~ 15V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" proceduredure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

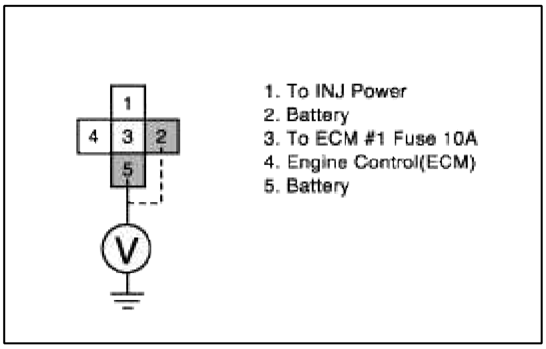
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check for open in harness(control relay power)
   (1) Ignition "OFF"
   (2) Disconnect the main relay.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 and 5 of main relay harness connector and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Check for open in harness(main relay control) " as below.

NO

Check for open in power harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case the voltage at terminal 2 and 5 of main relay power line is 0V.
Possible cause : Opne circuit in main relay power line which goes to main relay terminal 2 and 5 through PCM fuse(20A) in E/C-J/BOX

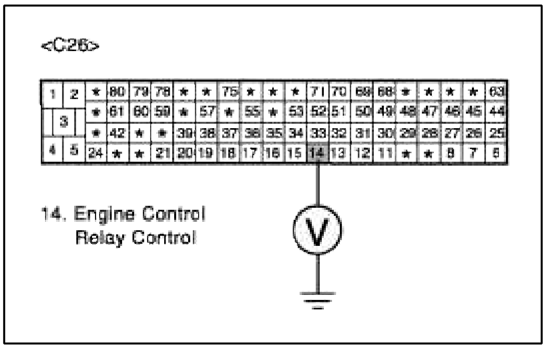
2. Check for open in harness(control relay control)

(1) Ignition "OFF"

(2) Connect PCM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure voltage between terminal 14 of PCM harness connector and chassis ground.


<C26>
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
14. Engine Control Relay Control
V

(5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Check for open in control harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

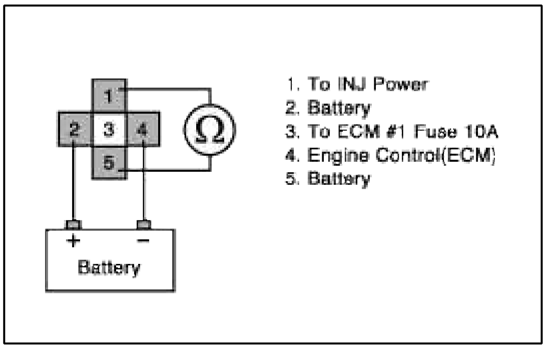
1. Check control relay

(1) Ignition "OFF"

(2) Disconnect the control relay

(3) Apply 12V and a ground to 1 and 2 terminals of the control relay

(4) Measure resistance between terminal 1 and 5 of relay connector(To sensor side)


1
2
3
4
5
Ω
+
−
Battery
1. To INJ Power
2. Battery
3. To ECM #1 Fuse 10A
4. Engine Control(ECM)
5. Battery

(5) Does each resistance indicate continuity circuit?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected,replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good control relay and check for proper operation. If the problem is corrected, replace control relay and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.

3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

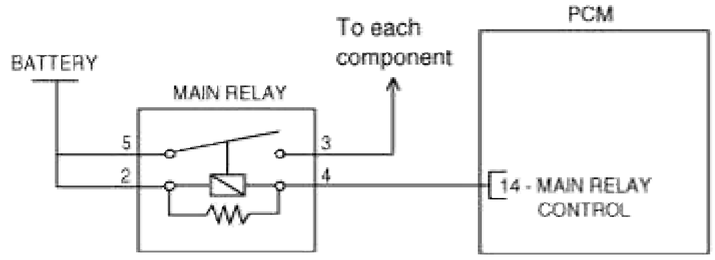
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

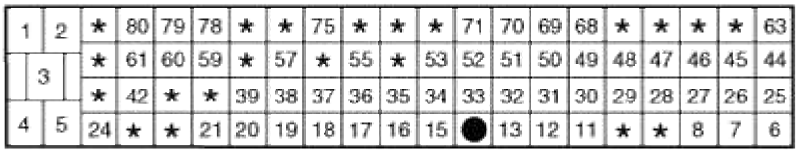
[CIRCUIT DIAGRAM]


BATTERY
MAIN RELAY
5
2
3
4
To each component
PCM
14 - MAIN RELAY CONTROL

[CONNECTION INFORMATION]

Terminal	Connected to	Function
5	Battery	Battery Voltage
4	PCM terminal 14	Main Relay Control
2	Battery	Battery Voltage
3	-	Supply B+

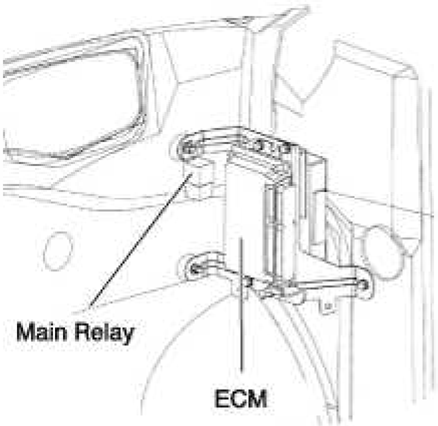
[HARNESS CONNECTORS]


1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 ● 13 12 11 ★ ★ 8 7 6

PCM

Engine Electrical System > Troubleshooting > P0563

COMPONENT LOCATION


Main Relay
ECM

GENERAL DESCTIPTION

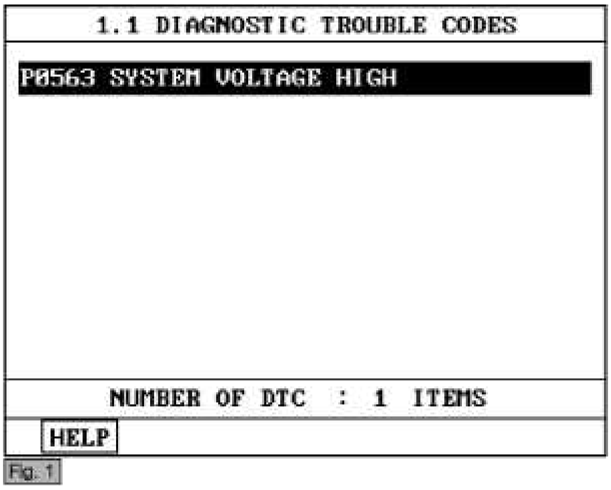
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, high	● Charging system ● Faulty PCM
Threshold value	● Voltage : > 17V	
Enable Conditions	● Vehicle speed > 25 kph(15.53428 mile)	
Diagnostic Time	● 0.2 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Battery voltage" parameter on the scantool.



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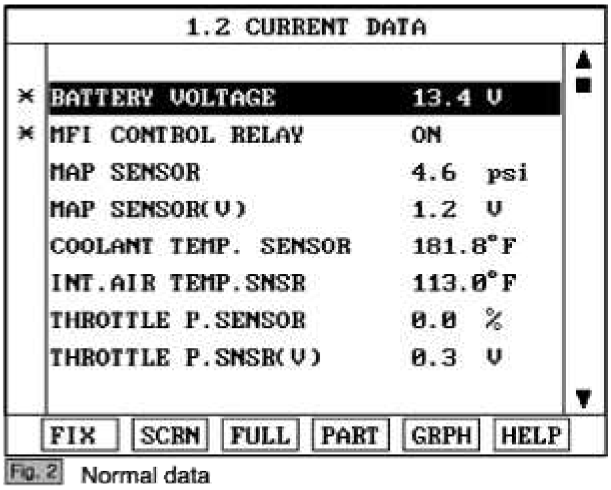
1.1 DIAGNOSTIC TROUBLE CODES

P0563 SYSTEM VOLTAGE HIGH

NUMBER OF DTC : 1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* BATTERY VOLTAGE          13.4 V
* MFI CONTROL RELAY        ON
  MAP SENSOR               4.6  psi
  MAP SENSOR(V)            1.2  V
  COOLANT TEMP. SENSOR     181.8°F
  INT.AIR TEMP.SNSR        113.0°F
  THROTTLE P.SENSOR        0.0  %
  THROTTLE P.SNSR(V)       0.3  V
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification
Engine stop : 11 ~ 13V
Idle : 12 ~ 15V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" proceduredure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

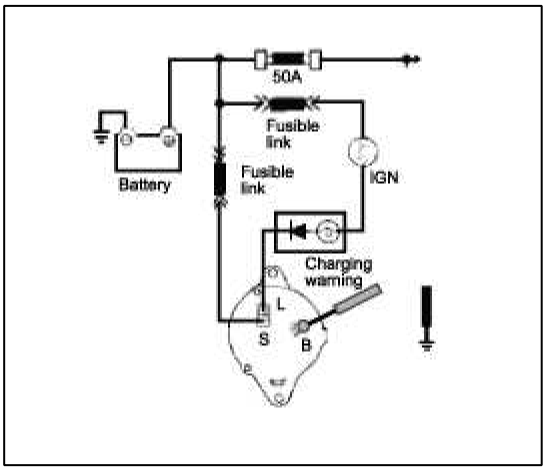
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check for generator voltage charging
   (1) Engine "ON"
   (2) Measure voltage between generator B+ and chassis ground.



   (3) Is measure voltage within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Over charging or bad connection of generator
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

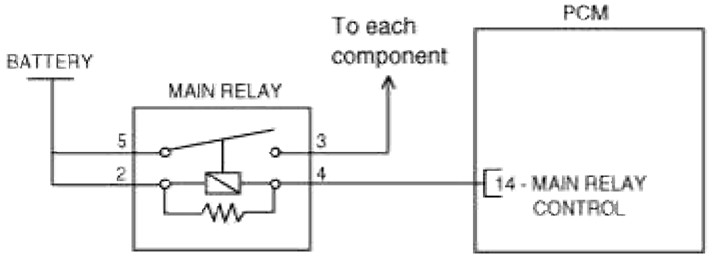
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

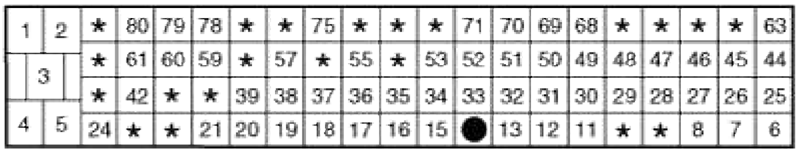
[CIRCUIT DIAGRAM]


BATTERY
MAIN RELAY
To each component
PCM
5
2
3
4
14 - MAIN RELAY CONTROL

[CONNECTION INFORMATION]

Terminal	Connected to	Function
5	Battery	Battery Voltage
4	PCM terminal 14	Main Relay Control
2	Battery	Battery Voltage
3	-	Supply B+

[HARNESS CONNECTORS]



1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
	3	★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	●	13	12	11	★	★	8	7	6

PCM

ACCENT(LC) > 2005 > G 1.5 SOHC > Engine Mechanical System

Engine Mechanical System > General Information > General Information

SPECIFICATIONS

	SPEC	LIMIT
General		
Type	In-line, SOHC	
No. of cylinder	4	
Bore	75.5 mm (2.97 in.)	
Stroke	83.5 mm (3.29 in.)	
Total displacement	1495 cc	
Compression ratio	10.0	
Firing order	1 - 3 - 4 - 2	
Valve timing		
Intake valve opens (BTDC)	12°	
Intake valve closes (ABDC)	52°	
Exhaust valve opens (BBDC)	52°	
Exhaust valve closes (ATDC)	12°	
Valve overlap	24°	
Cylinder head		
Flatness of gasket surface	Max. 0.03 mm (0.0012 in.)	0.08 mm (0.00315 in.)
Flatness of manifold mount'g surface	Max. 0.15 mm (0.0059 in.)	0.3 mm (0.0118 in.)
Dimension for reworking oversize valve seat hole		
Intake		
0.03 O.S.	28.8 ~ 28.821 mm (1.134 ~ 1.135 in.)	
0.06 O.S.	29.1 ~ 29.121 mm (1.146 ~ 1.1467 in.)	
Exhaust		
0.03 O.S.	34.3 ~ 34.325 mm (1.350 ~ 1.351 in.)	
0.06 O.S.	34.6 ~ 34.625 mm (1.362 ~ 1.363 in.)	
Valve guide hole diameter (intake/exhaust)		
0.05 O.S.	11.05 ~ 11.068 mm (0.435 ~ 0.436 in.)	
0.25 O.S.	11.25 ~ 11.268 mm (0.443 ~ 0.4436in.)	
0.50 O.S.	11.50 ~ 11.518 mm (0.453 ~ 0.4535in.)	
Camshaft		
Cam height intake	42.8575 mm (1.687 in.)	42.3575 mm (1.667 in.)
Cam height exhaust	42.7354 mm (1.682 in.)	42.2624 mm (1.664 in.)
Journal diameter	30 mm (1.181 in.)	
Bearing oil clearance	0.045 ~ 0.085 mm (0.0018 ~ 0.0033 in.)	
End play	0.07 ~ 0.28 mm (0.0027 ~ 0.011 in.)	
Crankshaft		
Journal diameter	50 mm (1.97 in.)	
Pin diameter	45 mm (1.77 in.)	
Bend	0.03 mm (0.0018 in.)	
Out of roundness of journal and pin	Max. 0.005	
Taper of journal and pin	Max. 0.005	
End play	0.05 ~ 0.175 mm (0.002 ~ 0.007 in.)	0.25 mm (0.0098 in.)

Undersize of Pin		
0.25	44.725 ~ 44.740 mm (1.76 ~ 1.761 in.)	
0.50	44.475 ~ 44.490 mm (1.75 ~ 1.751 in.)	
0.75	44.225 ~ 44.240 mm (1.74 ~ 1.741 in.)	
Undersize of Journal		
0.25	49.727 ~ 49.742 mm (1.957 ~ 1.958in.)	
0.50	49.477 ~ 49.492 mm (1.948 ~ 1.9485in.)	
0.75	49.227 ~ 49.242 mm (1.938 ~ 1.9386in.)	
Main bearing oil clearance		0.1 mm (0.00394 in.)
No. 1,2,4,5	0.020 ~ 0.040 mm (0.0008 ~ 0.0016 in.)	
No. 3.	0.028 ~ 0.046 mm (0.0011 ~ 0.0018 in.)	
Valve		
Stem diameter		
Intake	5.955 ~ 5.97 mm (0.2344 ~ 0.2350 in.)	
Exhaust	5.95 ~ 5.965 mm (0.2342 ~ 0.2348 in.)	
Face angle	45° ~ 45.5°	
Thickness of valve head (margin)		
Intake	1.1 mm (0.043 in.)	0.8mm (0.031in.)
Exhaust	1.4 mm (0.055 in.)	1.1 mm (0.043 in.)
Valve stem to valve guide clearance		
Intake	0.03 ~ 0.06 mm (0.0012 ~ 0.0024 in.)	0.1 mm (0.0039 in.)
Exhaust	0.035 ~ 0.065 mm (0.0014 ~ 0.0026 in.)	0.15 mm (0.006 in.)
Valve guide		
Length		
Intake	42.7 mm (1.681 in.)	
Exhaust	39.1 mm (1.539in.)	
Service oversize	0.05, 0.25, 0.50	
Valve seat		
Width of seat contact		
Intake	0.8 ~ 1.2 mm (0.031 ~ 0.047 in.)	
Exhaust	1.3 ~ 1.7mm (0.051 ~ 0.067 in.)	
Seat angle	45°	
Service oversize	0.3, 0.6	
Valve spring		
Free length (Installed height)	42.03 mm (1.655 in.)	
Load	24.7 kg / 34.5 mm	
Out of squareness	Max 1.5	
Cylinder block		
Cylinder bore	75.5 ~ 75.53 mm (2.9724 ~ 2.9736 in.)	
Out of roundness of cylinder bore	Max. 0.01	
Taper of cylinder bore	-	
Flatness of gasket surface	Max. 0.05	0.1 mm (0.0039 in.)
Piston		
Dameter	75.47 ~ 75.50 mm (2.9713 ~ 2.9724 in)	
Piston to cylinder clearance	0.02 ~ 0.04 mm (0.0078 ~ 0.00157 in.)	
Piston ring		

No. of rings per piston	3	
Compression ring	2	
Oil ring	1	
Compression ring type		
No. 1	Inside bevel type, steel	
No. 2	Taper type	
Oil ring type	3-piece type	
Side clearance		
No. 1	0.04 ~ 0.085 mm (0.0016 ~ 0.0033 in.)	0.1 mm (0.00394 in.)
No. 2	0.04 ~ 0.085 mm (0.0016 ~ 0.0033 in.)	0.1 mm (0.00394 in.)
Oil ring	0.06 ~ 0.15 mm (0.0023 ~ 0.006 in.)	
End gap		
No. 1	0.20 ~ 0.35 mm (0.0079 ~ 0.0138 in.)	1 mm (0.0394 in.)
No. 2	0.37 ~ 0.52 mm (0.015 ~ 0.02 in.)	1 mm (0.0394 in.)
Oil ring side rail	0.2 ~ 0.7 mm (0.008 ~ 0.028 in.)	1 mm (0.0394 in.)
Sevice oversize	0.25, 0.50	
Connecting rod		
Bend	Max. 0.05 per 100 mm	
Twist	Max. 0.1 per 100mm	
Connecting rod big end to crankshaft side clearance	0.10 ~ 0.25 mm (0.004 ~ 0.01 in.)	0.4mm(0.016in.)
Piston pin press in load	1000 ± 500 kg	
Bearing oil clearance	0.018 ~ 0.036 mm (0.0007 ~ 0.0014 in.)	0.1mm(0.0039in.)
Flywheel		
Runout	0.1mm (0.0014 in.)	0.13mm (0.005in.)
Oil pressure at curb idle speed (oil temp. 90~110°C)	1.5kg/cm^2	
Oil pump		
Clearance between outer circum ference and front	0.12 ~ 0.18 mm (0.0047 ~ 0.0071 in.)	
Clearance between roter axial side and front case	0.04 ~ 0.087 mm (0.0016 ~ 0.0034 in.)	
Tip clearance between outer and inner roter	0.025 ~ 0.069 mm (0.0010 ~ 0.0027 in.)	
Relief spring		
Free length	46.6 mm (1.8346 in.)	
Load	6.1kg at 40.1 mm (13.4216 at 1.578 in.)	
Cooling method	Water-cooled, Pressurized, Forced circulation with electrical fan	
Cooling sys. Quantity	6.5 lit (6.87 U.S. qut, 5.72 lmp qts)	
Thermostat		
Type	Wax pellet type with jiggle valve	
Normal opening temp.	82°C	
Opening temp. range	80.5 ~ 83.5°C	
Wide opening temp.	95°C	

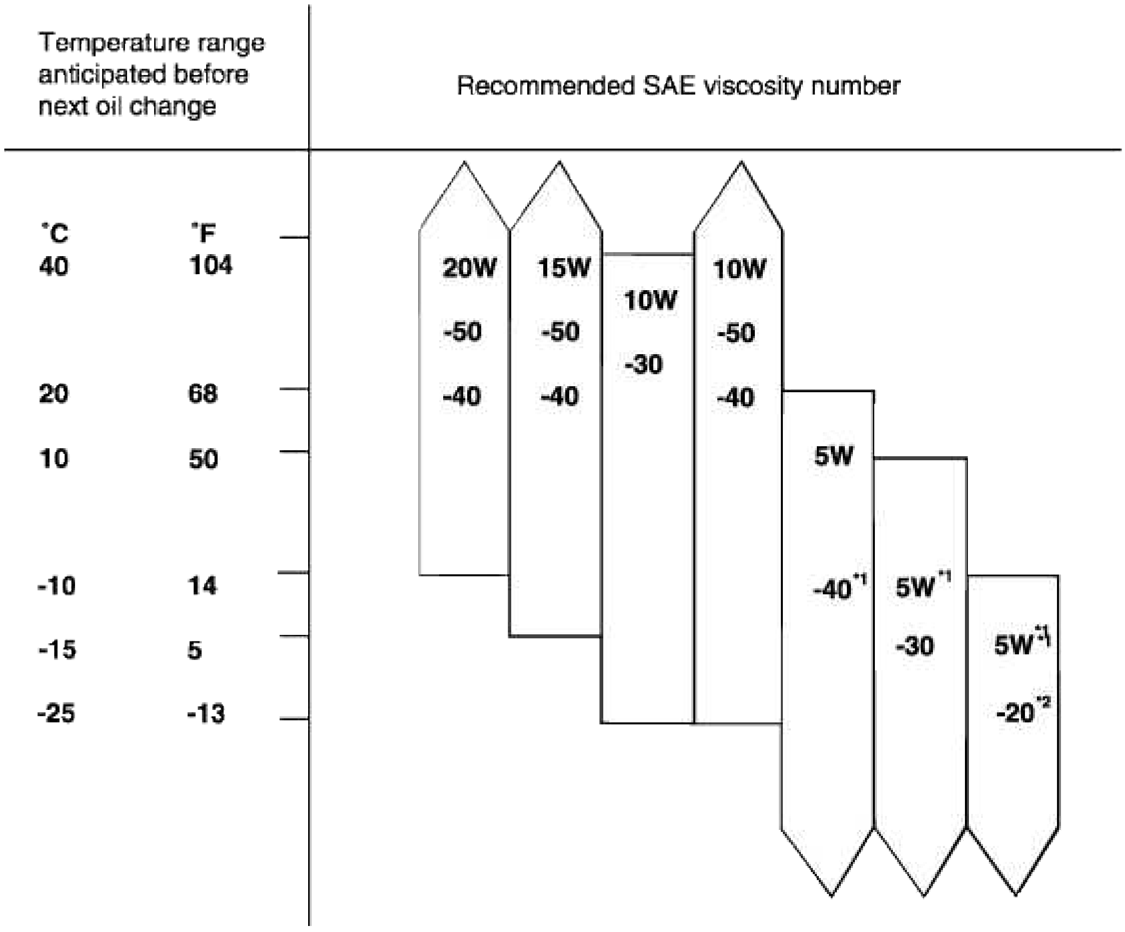
Radiator cap		
Main valve opening pressure	86.1 ~ 124.5 kpa	
Main valve colseing pressure	83.4 kpa	
Vacuum valve opening preesur	-86.6 kpa	
Air cleaner		
Type	Dry type	
Element	Unwoven cloth type	
Exhaust pipe		
Muffler	Expansion resonance type	
Suspension sys.	Rubber hanger type	

TIGHTENING TORQUE

Item	Nm	kg.cm	lb.ft
Cylinder Block			
Left engine support bracket bolt	30 ~ 42	300 ~ 420	22 ~ 31
Oil pressure switch	13 ~ 15	130 ~ 150	9.6 ~ 11
Cylinder head			
Cylinder head bolt	(23 ~ 27) + (60 + 60°)	(230 ~ 270) + (60° + 60°)	(17 ~ 20) + (60° + 60°)
Intake/manifold bolts or nuts	15 ~ 20	150 ~ 200	11 ~ 15
Exhaust manifold nut	15 ~ 20	150 ~ 200	11 ~ 15
Recker cover bolt	8 ~ 10	80 ~ 100	6 ~ 7
Recker arm shaft bolt	20 ~ 27	200 ~ 270	15 ~ 18
Rear plate bolt	8 ~ 10	80 ~ 100	6 ~ 7
Main Moving parts			
Connecting rod cap nut	32 ~ 35	320 ~ 350	24 ~ 26
Crankshaft bearing cap bolt	55 ~ 60	550 ~ 600	41 ~ 44
Flywheel M/T bolt	130 ~ 140	1300 ~ 1400	96 ~ 103
Drive plate A/T bolt	130 ~ 140	1300 ~ 1400	96 ~ 103
Timing Belt			
Crankshaft sprocket bolt	140 ~ 150	1400 ~ 1500	103 ~ 111
Camshaft sprocket bolt	80 ~ 100	800 ~ 1000	59 ~ 74
Timing belt tensioner bolt	20 ~ 27	200 ~ 270	15 ~ 20
Timing belt cover bolt	10 ~ 12	100 ~ 120	7 ~ 9
Front case bolt	12 ~ 15	120 ~ 150	9 ~ 11
Engine Mounting			
Engine mounting insulator bolt	90 ~ 110	900 ~ 1100	66.4 ~ 81.1
Engine mounting bracket to engine nuts and bolts	50 ~ 65	500 ~ 650	36.9 ~ 48.0
Transaxle mount insulator bolt			
Transaxle insulator bracket to side member bolts	90 ~ 110	900 ~ 1100	66.4 ~ 81.1
Front roll stoper insulator bolt	30 ~ 40	300 ~ 400	22.1 ~ 29.5
Front roll stoper bracket to sub-frame bolt			
Rear roll stoper insulator bolt	45 ~ 60	450 ~ 600	33.2 ~ 44.3
Rear roll stoper bracket to sub-frame bolt	30 ~ 40	300 ~ 400	22.1 ~ 29.5
	45 ~ 60	4520 ~ 600	33.2 ~ 44.3
	30 ~ 40	300 ~ 400	22.1 ~ 29.5

Oil filter	12 ~ 16	120 ~ 160	9 ~ 12
Oil pan bolts	10 ~ 12	100 ~ 120	7 ~ 9
Oil pan drain plug	40 ~ 45	400 ~ 450	30 ~ 33
Oil screen bolts	15 ~ 22	150 ~ 220	11 ~ 16
Timing belt upper cover bolts	10 ~ 12	100 ~ 120	7 ~ 9
Timing belt lower cover bolts	10 ~ 12	100 ~ 120	7 ~ 9
Surge tank to inlet manifold nuts and bolts	15 ~ 20	150 ~ 200	11 ~ 15
Alternator support and nut	20 ~ 25	200 ~ 250	15 ~ 18
Alternator lock bolt	15 ~ 22	150 ~ 220	11 ~ 16
Alternator brace mounting bolt	20 ~ 28	200 ~ 280	15 ~ 21
Cooling system			
Coolant pump pulley	8 ~ 10	80 ~ 100	6 ~ 7
Coolant pump bolt	12 ~ 15	120 ~ 150	9 ~ 11
Coolant temperature gauge unit	10 ~ 12	100 ~ 120	7 ~ 9
Coolant temperature sensor	15 ~ 20	150 ~ 200	11 ~ 15
Coolant outlet fitting bolt	17 ~ 20	170 ~ 200	13 ~ 15
Thermostat housing bolt	15 ~ 20	150 ~ 200	11 ~ 15
Intake and Exhaust system			
Air cleaner body mounting bolts	8 ~ 10	80 ~ 100	6 ~ 7
Resonator mounting bolts	4 ~ 6	40 ~ 60	2.9 ~ 4.3
Throttle body to surge tank bolts	15 ~ 20	150 ~ 200	11 ~ 15
Oxygen sensor to exhaust manifold	50 ~ 60	500 ~ 600	37 ~ 44
Front exhaust pipe to exhaust manifold nuts	30 ~ 40	300 ~ 400	22 ~ 30
Front exhaust pipe bracket bolts	30 ~ 40	300 ~ 400	22 ~ 30
Front exhaust pipe to cataiytic converter bolts	40 ~ 60	400 ~ 600	30 ~ 44

SELECTION OF ENGINE OIL



***1 Restricted by driving condition and environment.**
***2 SAE5W-20 Not recommended for sustained high speed vehicle operation**

NOTE

For best performance and maximum protection of all types of operation, select only those lubricants which:

1. Satisfy the requirements of the API classification.
2. Have proper SAE grade number for expected ambient temperature range.

Lubricant that does not have both an SAE grade number and an API service classification on the container should not be used.

MAINTENCE

CHECKING ENGINE OIL

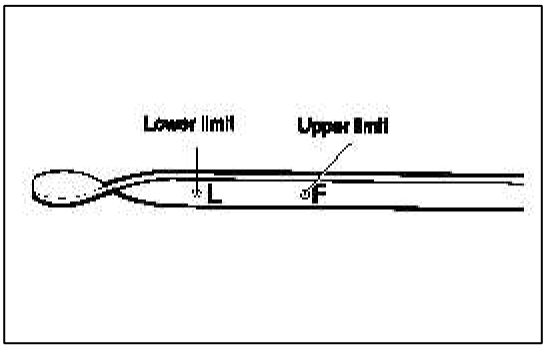
1. Position the vehicle on a level surface.
2. Warm up the engine.

NOTE

If a vehicle has been out of service for a prolonged period of time, warm up the engine for approximately 20 minutes.

3. Turn off the engine, and wait 2 or 3 minutes, then check the oil level.

4. Check that the engine oil level is within the level range indicated on the oil dipstick if the oil level is found to have fallen to the lower limit (the "L" mark), refill to the "F" mark.



NOTE

When refilling, use the same type of engine oil.

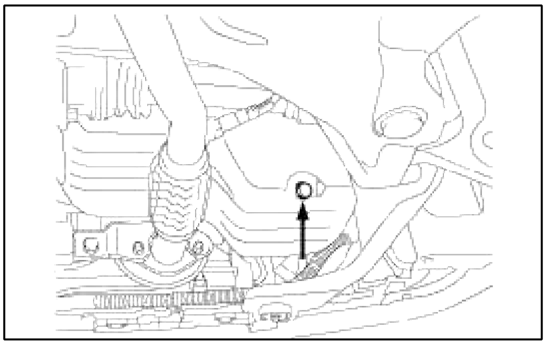
5. Check that the oil is not dirty or contaminated with coolant or gasoline and that it has proper viscosity.

CHANGING ENGINE OIL

WARNING

Be careful not to burn yourself, the engine oil is hot.

1. Run the enigne until it reaches normal operating temperature.
2. Turn off the engine.
3. Remove the oil filler cap and the engine oil drain plug. Drain the engine oil.



4. Install and tighten the drain plug to the specified torque.

Tightening torque
Drain plug : 40 ~ 45 Nm (400 ~ 450 kg.cm, 30 ~ 33 lb.ft)

NOTE

Whenever tightening the oil drain plug, use a new drain plug gasket.

5. Fill the crankcase with fresh engine oil through the oil filler cap opening.

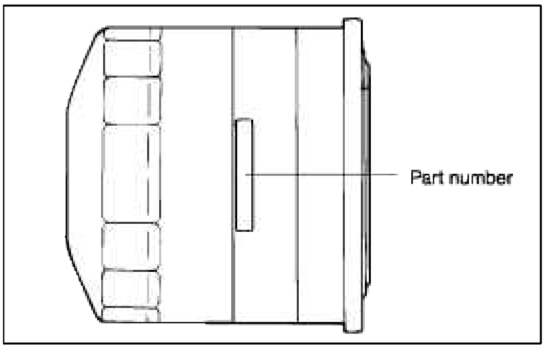
Drain and Refill Without oil filter :
3.0 liter (3.17 U.S. qts., 2.64 lmp. qts.)
Drain and Refill With oil filter :
3.3 liter (3.48 U.S. qts., 2.90 lmp. qts.)

---

6. Install the oil filler cap.
7. Start and run the engine.
8. Turn off the engine and then check the oil level. Add oil if necessary.

FILTER SELECTION

All Hyundai engines are dquipped with a high quality, disposable oil filter. This filter is recommended as a replacement filter on all vehicles. The quality of replacement filters varies considerably. Only high quality filters should be used to assure the most efficient service. Make sure that the rubber gasket from the old oil filter is completely removed from the contact surface on the engine block or front case before installing the new filter.

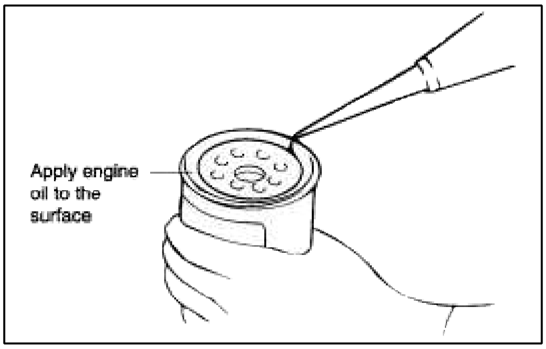


PROCEDURE FOR REPLACING THE OIL FILTER

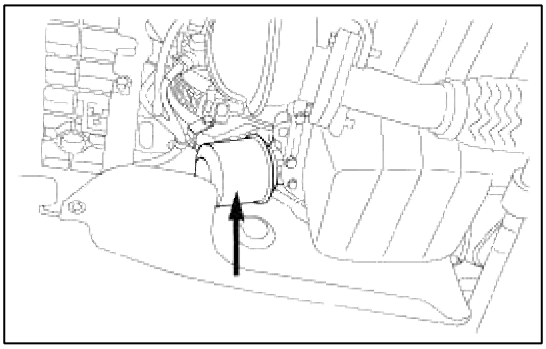
CAUTION

Be careful not to burn yourself, the engine and engine oil are hot.

1. Use a filter wrench to remove the oil filter.
2. Before installing the new oil filter on the engine clean oil filter sealing baseplate with shop towel. Apply engine oil to the surface of rubber packing.



3. Tighten the oil filter to the specified torque.



Tightening torque

Oil filter : 12 ~ 16 Nm (120 ~ 160 kg.cm, 9 ~ 12 lb.ft)

4. Run the engine to check for engine oil leaks.
5. After turning off the engine, check the oil level and add oil as necessary.

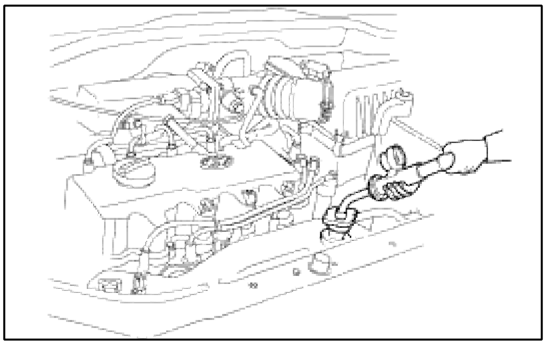
CHECKING COOLANT LEAK

1. Wait until the engine is cool, then carefully remove the radiator cap.
2. Confirm that the coolant level is up to the filler neck.

3. Install a radiator cap tester to the radiator filler neck and apply 140 KPa (1.4 kg/cm², 20 psi) pressure. Hold it for two minutes in that condition, while checking for leakage from the radiator, hoses or connections.

> **NOTE**
>
> 1. Radiator coolant may be extremely hot. Do not open the system because hot, or scalding water could gush out causing personal injury. Allow the vehicle to cool before servicing this system.
> 2. Be sure to clean away any moisture from the places checked completely.
> 3. When the tester is removed, be careful not to spill any coolant.
> 4. Be careful when installing and removing the tester and when testing do not deform the filler neck of the radiator.

4. If there is leakage, repair or replace with the apropriate part.



RADIATOR CAP PRESSURE TEST

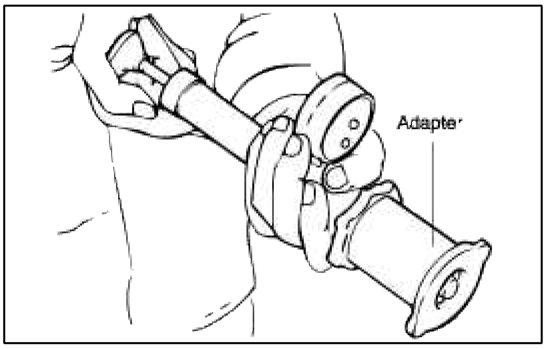
1. Remove the radiator cap. Wet its seal with engine coolant, then install it on the tester.
2. Increase the pressure until the gauge stops moving.

Main valve opening pressure :
78 ~ 108 kPa (0.8 ~ 1.1 kg/cm², 11.3 ~ 15.6 psi)
Limit : 65 kPa (0.66 kg/cm², 9.2 psi)

---

3. Check that the pressure level is maintained at or above the limit.
4. Replace the radiator cap if the reading does not remain at or above the limit.

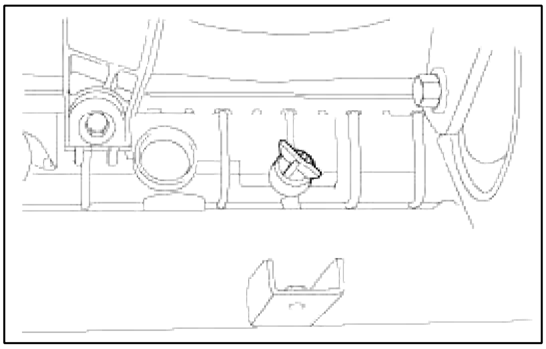
> **NOTE**
>
> Be sure that the cap is clean before testing. Rust or other foreign material on the cap seal will cause an incorrect reading.



CHANGING ENGINE COOLANT

> **CAUTION**
>
> When pouring engine coolant, be sure to shut the relay box lid and not to let coolant spill on electrical parts or the paint. If any coolant spills, rinse it off immediately.

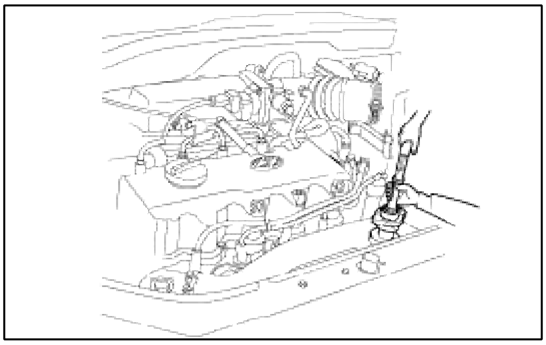
1. Slide the heater temperature control lever to maximum heat. Make sure the engine and radiator are cool to the touch.
2. Remove the radiator cap.
3. Loosen the drain plug and drain the coolant.



4. Tighten the radiator drain plug securely.
5. Remove, drain and reinstall the reservior.
   Fill the tank halfway to the MAX mark with water, then up to the MAX mark with antifreeze.
6. Pour coolant into the radiator up to the base of the filler neck, and install the radiator cap loosely.
7. Start the engine and let it run until it warms up (the radiator fan comes on at least twice)
8. Turn off the engine. Check the level in the radiator, add coolant if needed.
9. Put the radiator cap on tightly, then run the engine again and check for leaks.

SPECIFIC GRAVITY TEST

1. Measure the specific gravity of the coolant with a hydrometer.
2. Measure the coolant temperature and calculate the concentration from the relation between the specific gravity and temperature, using the following table for reference.



RELATION BETWEEN COOLANT CONCENTRATION AND SPECIFIC GRAVITY

Coolant temperature °C (°F) and specific gravity					Freezing temperature °C (°F)	Safe operating temperature °C (°F)	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)			
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30%
1.063	1.058	1.054	1.049	1.044	-20 (-4)	-15 (5)	35%
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40%
1.079	1.074	1.069	1.064	1.058	-30 (-22)	-25 (-13)	45%
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50%
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55%
1.103	1.098	1.092	1.084	1.076	-50 (-58)	-45 (-49)	60%

CAUTION

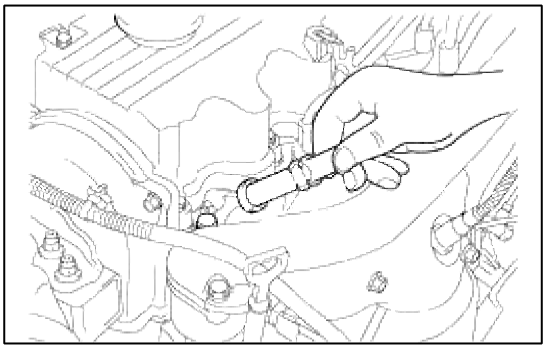
- If the concentration of the coolant is below 30%, its anti-corrosion properties will be adversely affected.
- If the concentration is above 60%, both the antifreeze and engine cooling property will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.
- Do not mix with another brand's product.

RECOMMENDED COOLANT

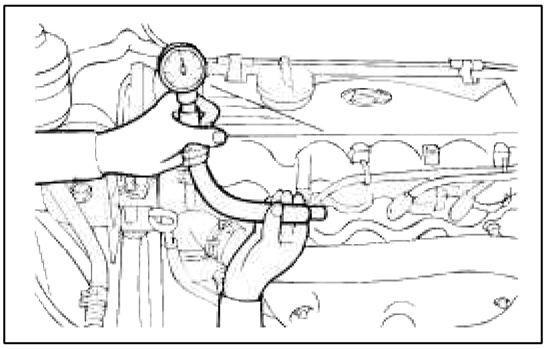
Antifreeze	Mixture ratio of anti freeze in coolant
ETHYLENE GLYCOL BASE FOR ALUMINUM	50% [Except tropical areas] 40% [Tropical areas]

CHECKING COMPRESSION PRESSURE

1. Befor checking engine compression, check the engine oil level. Also check that the starter motor and battery are all in normal operating condition.
2. Check the DTC's. Resetting the ECM will erase any stored DTC's.
3. Start the engine and wait until engine coolant temperature reaches 80~95°C (176~205°F).
4. Disconnect the fuel pump connector.
5. Turn off engine and disconnect the spark plug cables.



6. Remove the spark plug.
7. Disconnect the ignition coil connector.
8. Crank the engine to remove any foreign material in the cylinders.
9. Insert the compression gauge into the spark plug hole.



10. Depress the accelerator pedal to open the throttle fully.
11. Crank the engine and read the gauge.

Standard value : 1500 kpa (15.5 kg/cm², 220 psi)
Limit : 1200 kpa (12.5 kg/cm², 178 psi)

12. Repeat steps 9 to 11 on all cylinders, ensuring that the pressure differential for each of the cylinders is within the specified limit.

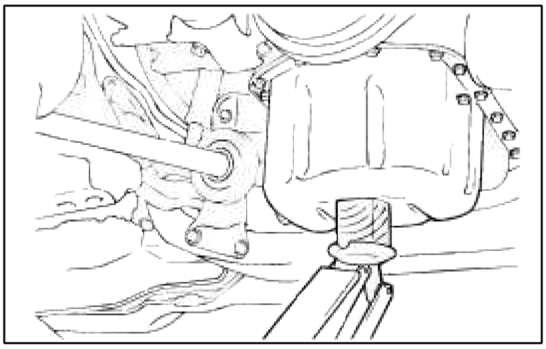
    Limit :
    Max. 150 kpa (1.5 kg/cm², 21 psi) between cylinders

13. If a cylinder's compression or pressure differential is outside the specification, add a small amount of oil through the spark plug hole, and repeat steps 9 to 12.
    A. If the addition of oil makes the compression toincrease, it is likely that there may be wear between the piston ring and cylinder wall.
    B. If compression remains the same, valve seizure, poor valve seating or a compression leak from the cylinder head gasket are all possible causes.

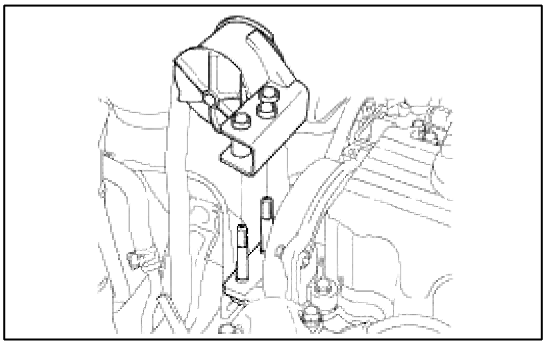
    Tightening torque
    Spark plug : 20~30 Nm (200~300 kg.cm, 14~22 lb.ft)

ADJUSTING TIMING BELT TENSION

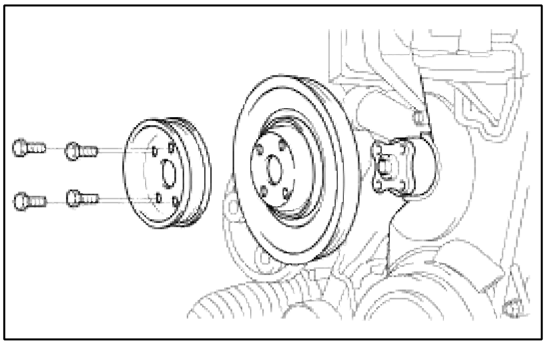
1. Turn the steering wheel fully counter clock wise.
2. Lift the vehicle by using of jack.



3. Remove the engine support bracket.

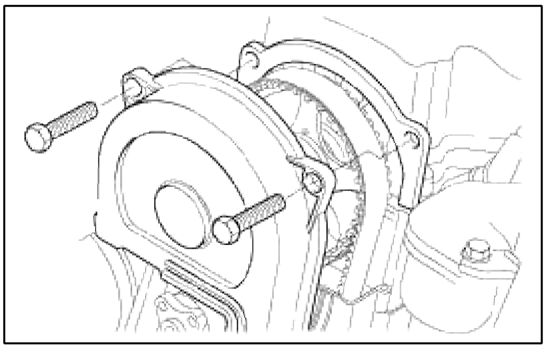


4. Loosen the coolant pump pulley mounting bolt and loosen the generator belt tension adjustment bolt.

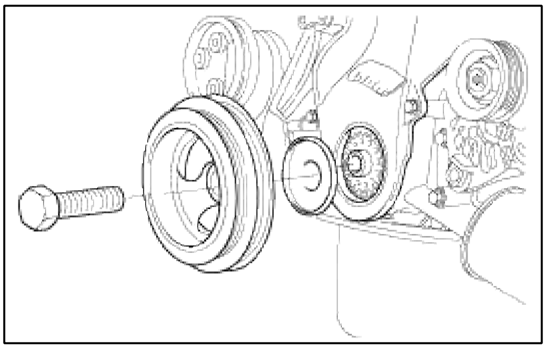


5. Remove the coolant pump pulley, generator belt, power steering pulley and power steering belt.

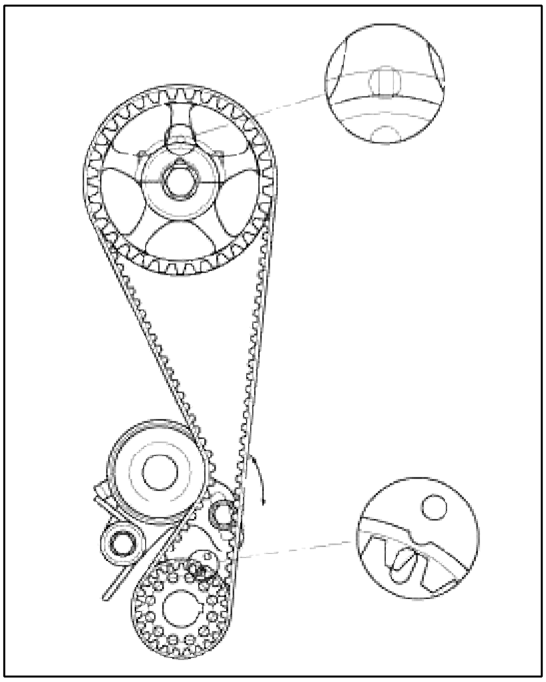
6. Remove the timing cover upper side mounting bolt.



7. Remove the crankshaft pulley.



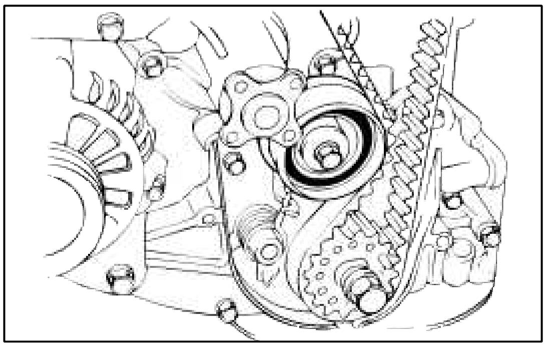
8. Turn crankshaft clockwise until enginder number 1 is at top clead center of its compression stroke.



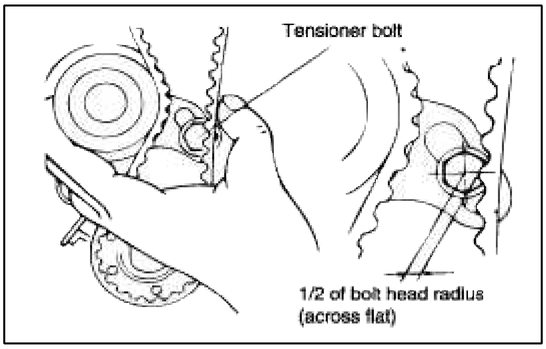
NOTE

Turn the crankshaft clockwise. If turned counter clockwise, tension is not set.

9. Loosen the tensioner bolt 1 ~ 2 turns and allow tensioner spring to tension the belt.



10. Turn crankshaft clockwise as much as two camshaft sprocket teeth.
11. Tighten the tensioner bolt of slot side of first and then tighten the bolt of pivot side.
12. Check to make sure timing marks line up.
13. Check the tension of timing belt.
    When the tensioner and the tension side of the timing belt are pushed in horizontally with a moderate force [approx. 49N (11 lb)], the timing belt log end is approx. half of the tensioner mounting bolt head radius away from the bolt head center.



14. Install the timing belt cover.

Tightening torque :
10 ~ 12 Nm (100 ~ 120 kg.cm, 7.2 ~ 8.7 lb.ft)

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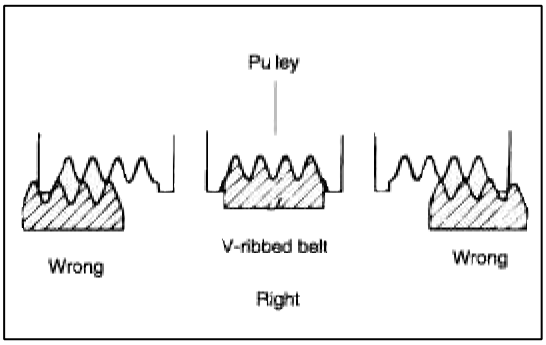
15. Install the crankshaft pulley.
16. Install the coolant pump pulley.
17. Install V-belt and adjust the belt tension.

ADJUSTING DRIVE BELT TENSION

1. Check that the belts are not damaged and are properly fit for the pulley grooves.
2. Apply 100 N (22 lbs.) force to the back and midway portion of the belt between the pulleys as shown in the illustration. Measure the amount of deflection with a tension gauge.

CAUTION

1. When installing the V-ribbed belt, check that the V-ribs are properly aligned.
2. If noise or slippage is detected, check the belt for wear, damage, or breakage on the pulley contact surface, and check the pulley for scoring. Also check the amount that the belt is deflected.



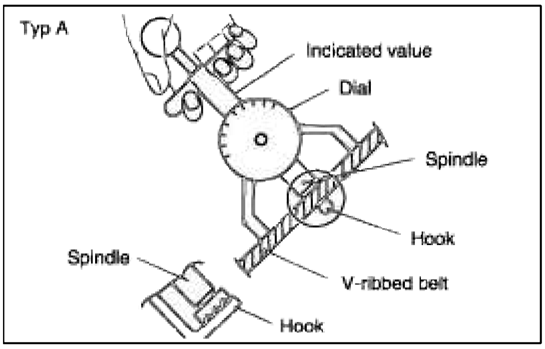
STANDARD VALUE :

Items		Adjustment	
		New	Used
For alternator	Deflection mm (in.)	7.5 ~ 9.0 (0.29 ~ 0.35)	10 (0.39)

NOTE

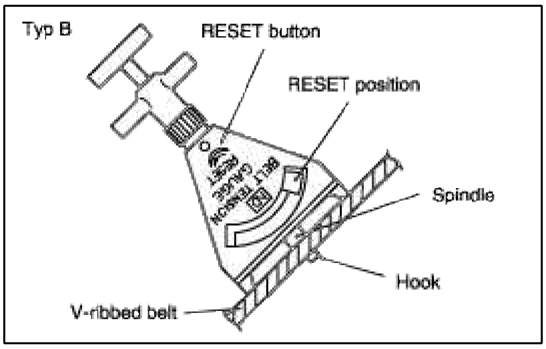
1. The belt tension must be measured half - way between the specified pulleys.
2. When a new belt is installed, adjust the tension to the central value of the standard range indicated under "New" in the above table. Let the engine idle for 5 minutes or more, and check the standard value indicated under "Inspection".
3. When adjusting a belt which has been used, or newly installed, after 5 minutes or more of operation, refer to the standard value indicated under "Used" in the above table.
4. Refer to the standard value indicated under "Inspection" for periodic inspections.

TYPE A TENSION GAUGE



TYPE B TENSION GAUGE

1. When measuring, turn the reset button in the direction of the arrow and set the gauge needle to the RESET position.
2. If the tension gauge is removed from the belt, the needle will still indicate the tension. Read the tension value after removing the gauge.



ADJUSTING THE ALTERNATOR BELT

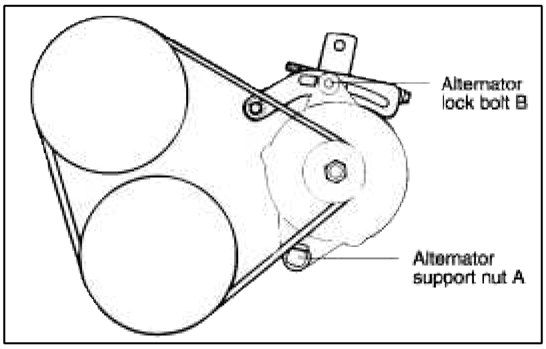
CAUTION

If the belt is too loose, it will cause noise or sudden wear.
If the belt is too tight, the engine coolant pump bearing or the alternator can get damaged.

1. Loosen the alternator nut "A" and the tension adjuster lock bolt "B"
2. Using the tension adjuster bolt, adjust the belt tension to the specification.
3. Tighten the adjuster lock bolt "B".
4. Tighten the alternator nut "A".

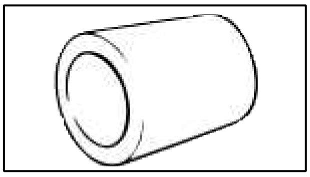
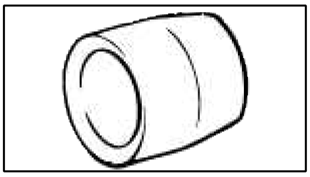
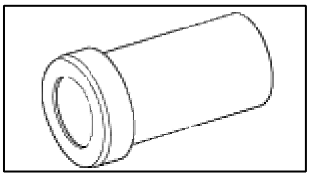
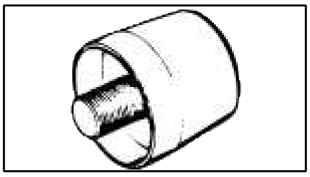
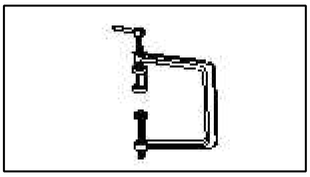
5. Check the tension or the deflection of belt, readjust if necessary.

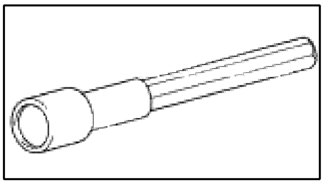
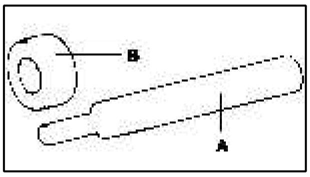
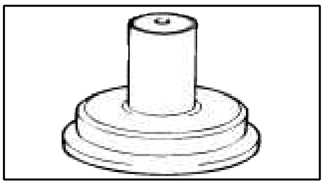
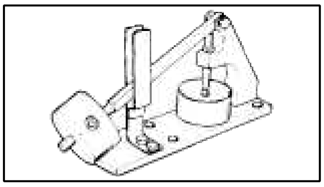
Tightening torque
Alternator support nut A :
20 ~ 25 Nm (200 ~ 250 kg.cm, 15 ~ 18 lb.ft)
Alternator lock bolt B :
15 ~ 22 Nm (150 ~ 220 kg.cm, 11 ~ 16 lb.ft)
Alternator brace mounting bolt :
20 ~ 28 Nm (200 ~ 280 kg.cm, 15 ~ 21 lb.ft)



Engine Mechanical System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
Crankshaft front oil seal installer 09231 - 22000		Installation of the crankshaft front oil seal (use with 09231 - 22100)
Crankshaft front oil seal guide 09231 - 22100		Installation of the crankshaft front oil seal (use with 09231 - 22000)
Camshaft oil seal installer 09221 - 21000		Installation of the camshaft oil seal (use with 09221 - 21100)
Camshaft oil seal guide 09221 - 21100		Used as a guide when pressing in the camshaft oil seal (use with 09221 - 21000)
Valve spring remover and installer 09222 - 28000 09222 - 28100		Removal and installation of the inlet or exhaust valve

Valve stem oil seal installer 09222 - 22001		Installation of the valve stem oil seal
Valve guide installer 09221 - 3F100 A/B		Removal and installation fo the valve guide
Crankshaft rear oil seal installer 09231 - 21000		1) Installation of the engine rear oil seal 2) Installation of the crankshaft rear oil seal
Leak down tester 09246 - 32000		Leak down test of auto lash adjuster

Engine Mechanical System > General Information > Troubleshooting

TROUBLE SHOOTING

Symptom	Probable cause	Remedy
Low compression	Blown cylinder head gasket	Replace gasket
	Worn or damaged piston rings	Replace rings
	Worn piston or cylinder	Repair or replace the piston and/or cylinder block
	Worn or damaged valve seat	Repair or replace the valve and/or seat ring
Low oil pressure	Low engine oil level	Check engine oil level
	Faulty oil pressure switch	Replace
	Clogged oil filter	Replace
	Worn oil pump gears or cover	Replace
	Thin or diluted engine oil	Change and find out cause
	Oil relief valve stuck (open)	Repair
	Excessive bearing clearance	Replace
High oil pressure	Oil relief valve stuck (closed)	Repair
Excessive engine vibration	Loose engine roll stopper (front, rear)	Retighten
	Loose transaxle mount bracket	Retighten
	Loose engine mount bracket	Retighten
	Loose center member	Retighten

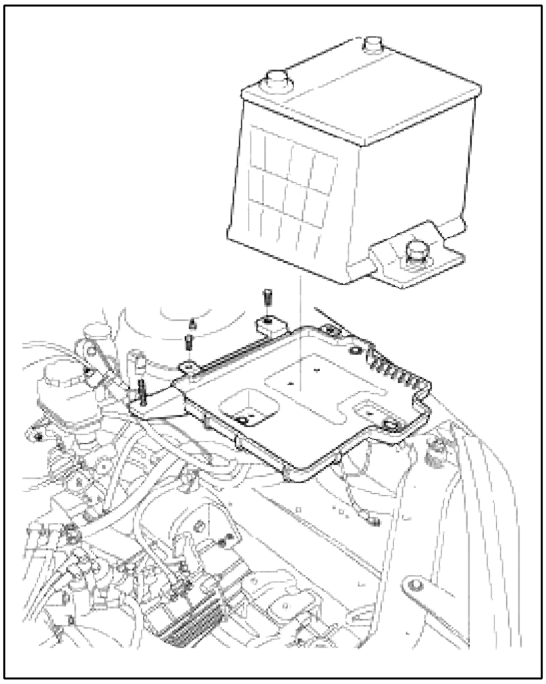
	Broken transaxle mount insulator	Replace
	Broken engine mount insulator	Replace
	Broken engine roll stopper insulator	Replace
Noisy valves	Thin or diluted engine oil (Low oil pressure)	Change
	Worn or damaged valve stem or valve guide	Replace
Connecting rod and main bearing noise	Insufficient oil supply	Check engine oil level
	Thin or diluted engine oil	Change and find out cause
	Excessive bearing clearance	Replace
Timing belt noise	Incorrect belt tension	Adjust belt tension
Low coolant level	Leakage of coolant	
	1. Heater or radiator hose	Repair or replace parts
	2. Faulty radiator cap	Tighten or replace clamps
	3. Thermostat housing	Replace the gasket or housing
	4. Radiator	Repair or replace
	5. Engine coolant pump	Replace parts
Clogged radiator	Foreign material in coolant	Replace coolant
Abnormally high coolant temperature	Faulty thermostat	Replace parts
	Faulty radiator cap	Replace parts
	Restricted flow in cooling system	Clear restriction or replace parts
	Loose or missing drive belt	Adjust or replace
	Faulty water pump	Replace
	Faulty temperature sensor or wiring	Repair or replace
	Faulty electric fan	Repair or replace
	Insufficient coolant	Refill coolant
Abnormally low coolant temperature	Faulty thermostat	Replace
	Faulty temperature sensor or wiring	Replace or repair
Leakage from oil cooling system	Loose connections	Replace
	Cracked or damaged ; hoses, pipes or oil cooler	Replace or repair
Inoperative electrical cooling fan	Damaged : Thermo sensor, Electrical motor, Radiator fan relay, Wiring	Replace or repair
Exhaust gas leakage	Loose connections	Retighten
	Broken pipe or muffler	Repair or replace
Abnormal noise	Detached baffle plate in muffler	Replace
	Broken rubber hanger	Replace
	Pipe or muffler contacting vehicle body	Correct
	Broken pipe or muffler	Repair or replace

Engine Mechanical System > General Information > Repair procedures

ENGINE AND TRANSAXLE ASSEMBLY

REMOVAL

1. Remove the battery.



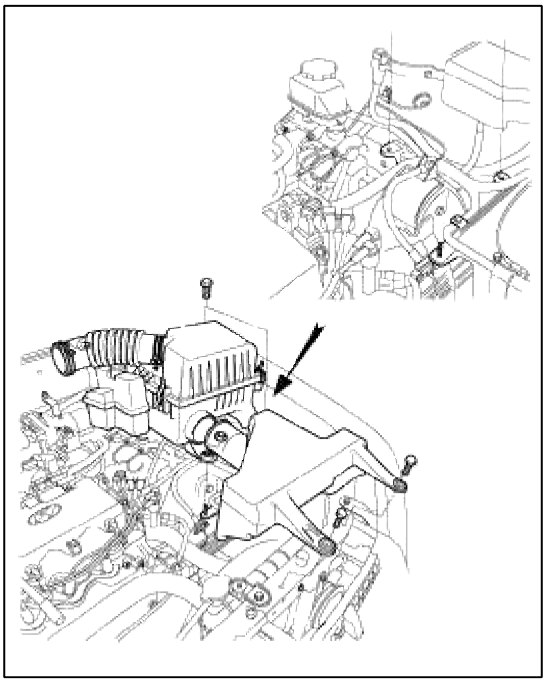
WARNING

Make sure jacks and safety stands are placed properly and hoist brackets are attached to the correct position on the engine.

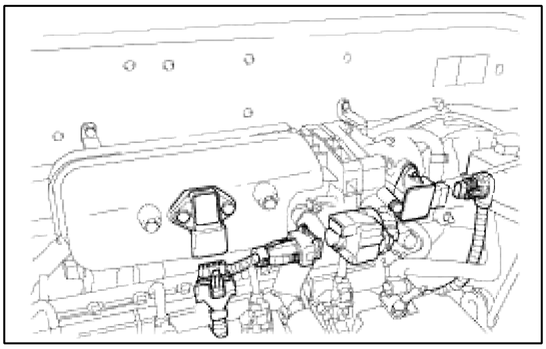
CAUTION

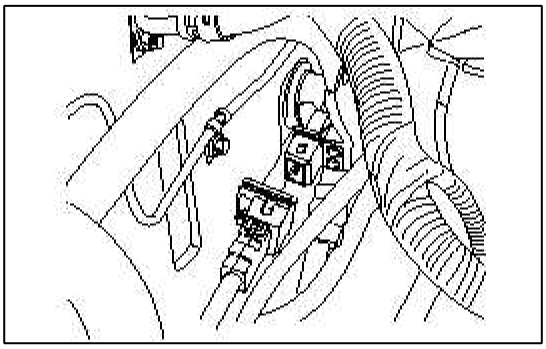
Use fender covers to avoid damaging painted surface.

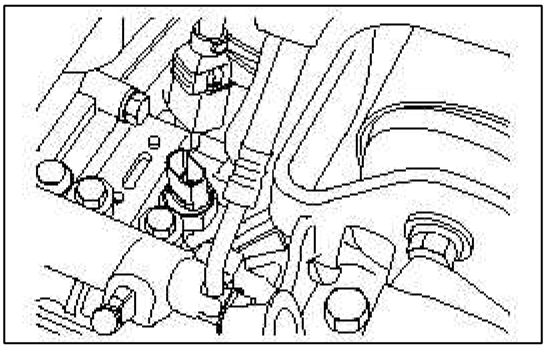
2. Detach the air cleaner.



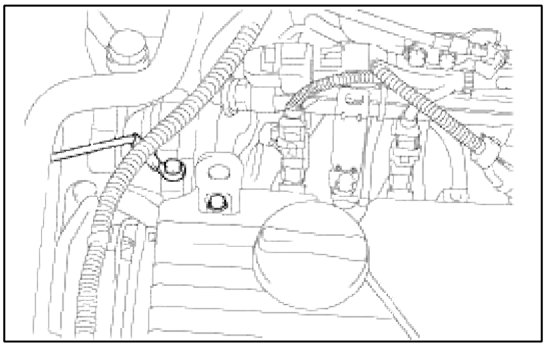
3. Disconnect the backup lamp and engine harness connectors.



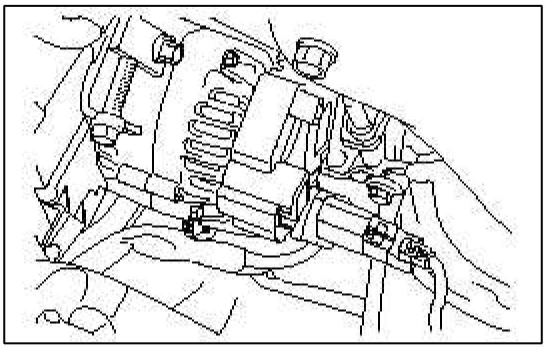


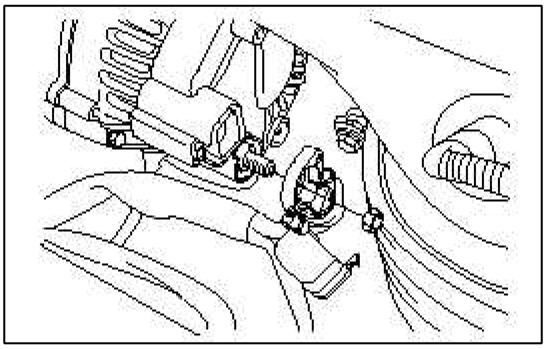


4. Disconnect the engine ground.

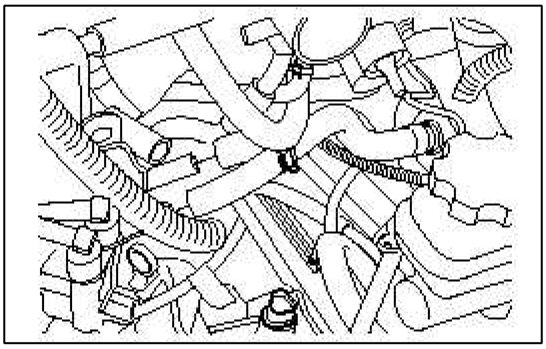


5. Disconnect the alternator connector.

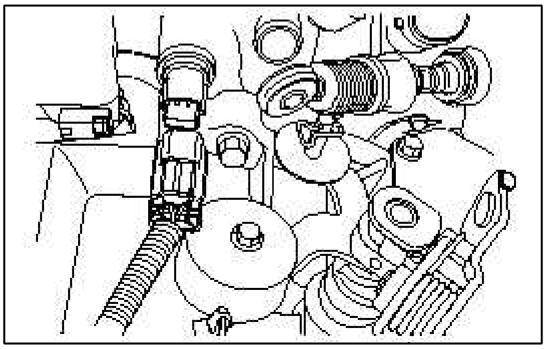


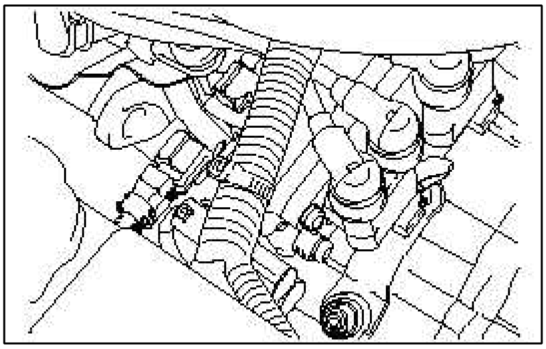


6. Disconnect the connectors for the rear Oxygen sensor harness and the ignition coil harness.

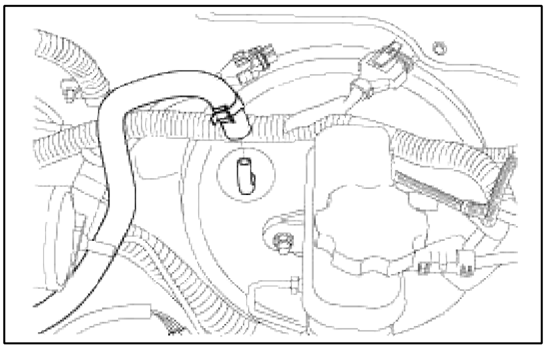


7. Disconnect the coolant temperature sensor and No.1 TDC sensor connector.

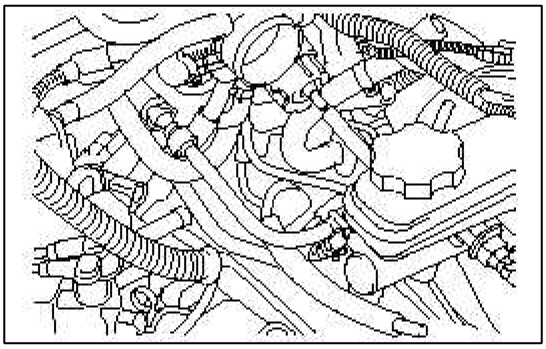


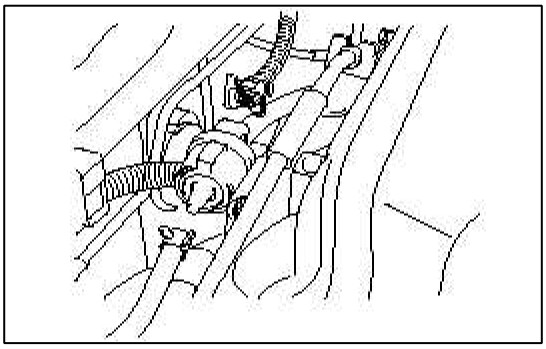


8. Disconnect the brake booster vacuum hose.



9. Remove the main fuel line and the return and vapor hoses form the engine side.

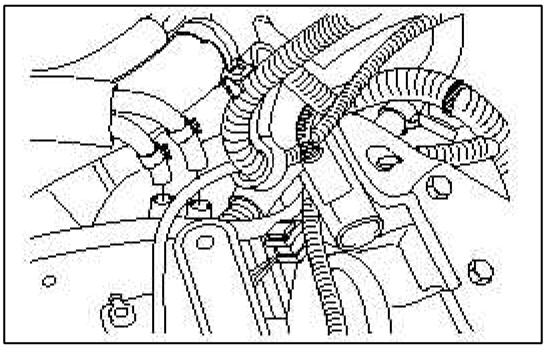




CAUTION

To reduce the residual pressure in the hoses, refer to Group Fuel System "Fuel filter replacement."

10. For vehicles with automatic transaxles, disconnect transaxle oil cooler hoses.



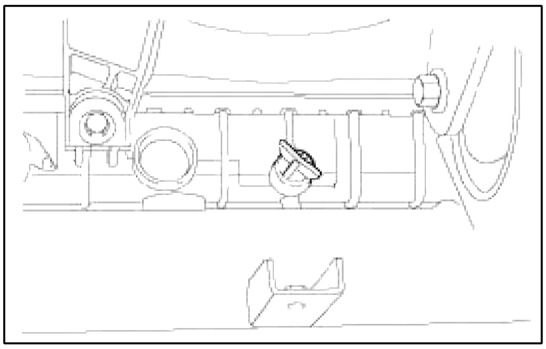
NOTE

When disconnecting the hoses, make identification marks to avoid making mistakes when reconnecting them.

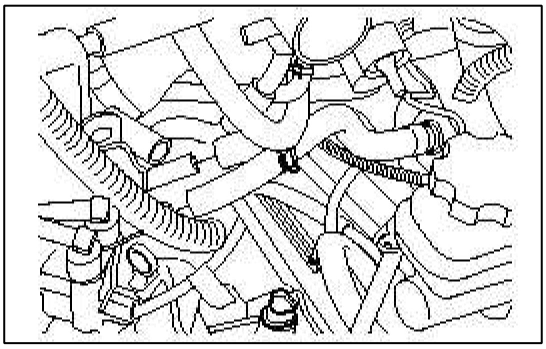
CAUTION

Be caurful not to spill oil or fluid from hoses, plug the openings to prevent foreign material from entering.

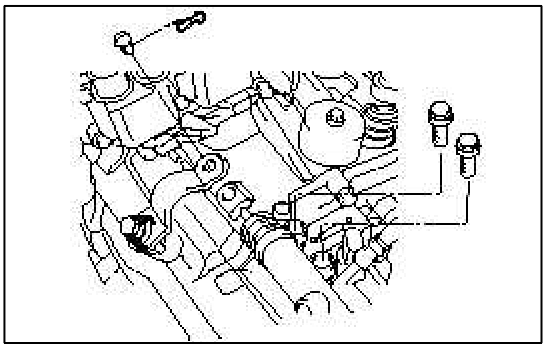
11. Drain the engine coolant from the radiator.



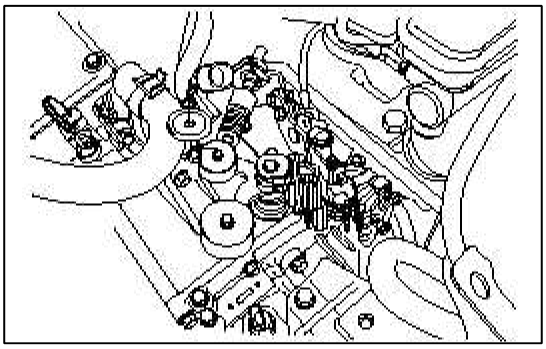
12. Disconnect the radiator upper and lower hoses on the engine side, then remove the radiator assembly.
13. Disconnect the heater hoses (inlet and outlet) on the engine side.



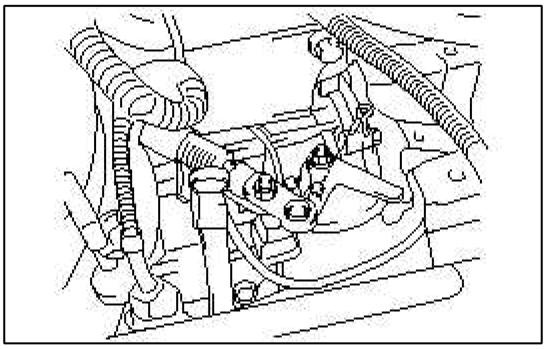
14. Disconnect the accelerator cable at the engine side.
15. For vehicles with 5-speed manual transaxles, remove the clutch release cylinder.

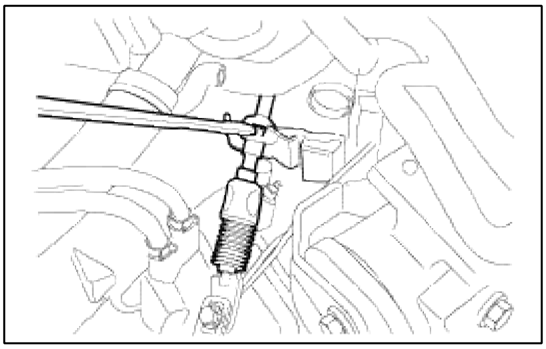


16. For vehicles with manual transaxles, remove the shift control cable from the transaxle.

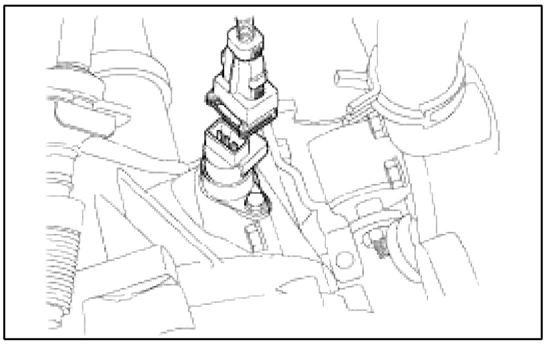


17. For vehicles with automatic transaxles, remove the control cable from the transaxle.

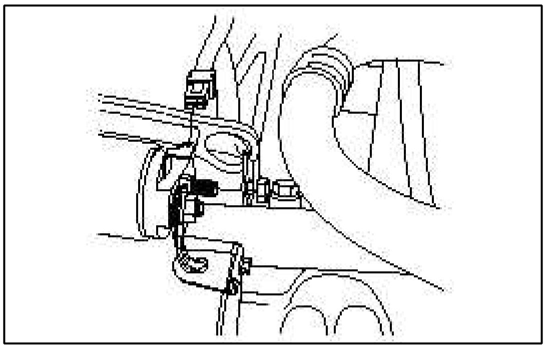


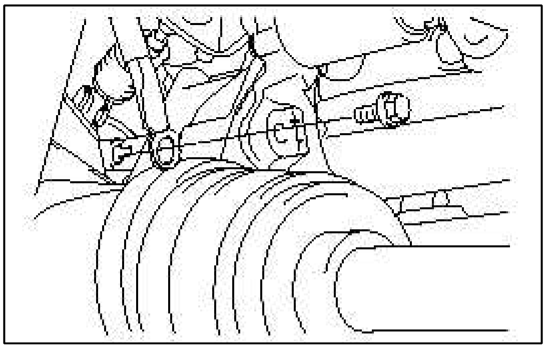


18. Disconnect the speedometer cable from the transaxle.



19. Disconnect the air conditioning compressor from the mounting bracket.
20. Disconnect the starter motor connector and ground.

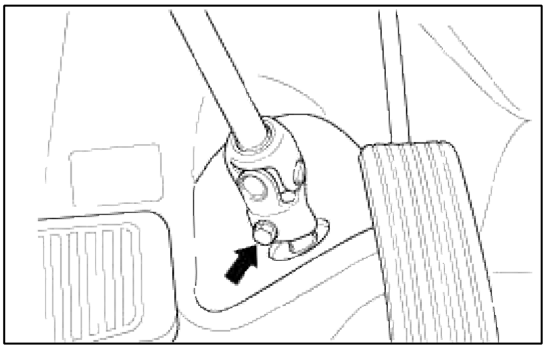




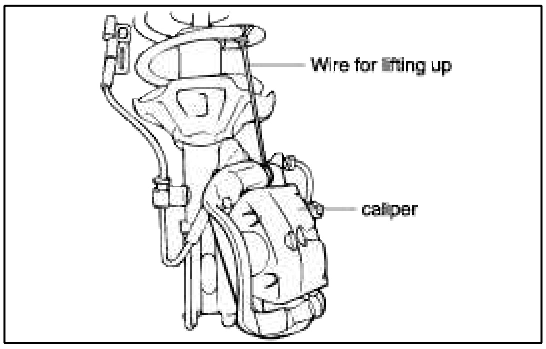
21. Remove the steering dust cover, the U-joint bolt and the gear box assembly.

NOTE

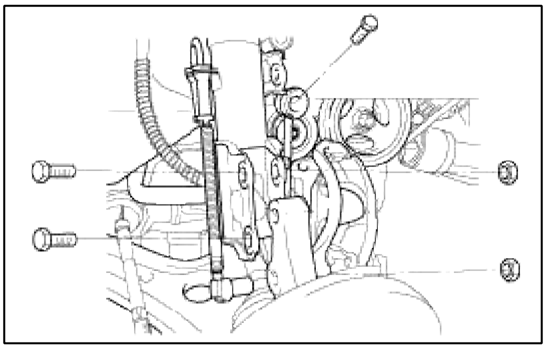
Mark between U-joint and gear box before disassembling.



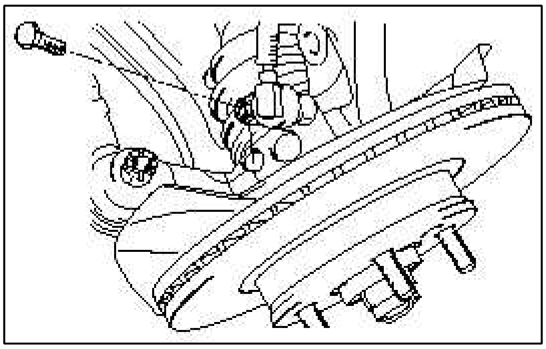
22. Jack up the vehicle and remove the front tire.
23. Remove the caliper assembly from knuckle and hold the upper side.



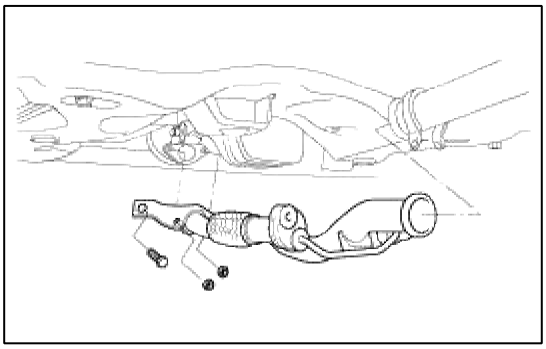
24. Loosen the strut lower bolt and separate from the knuckle.



25. Remove the wheel speed sensor from the knuckle. (with ABS)

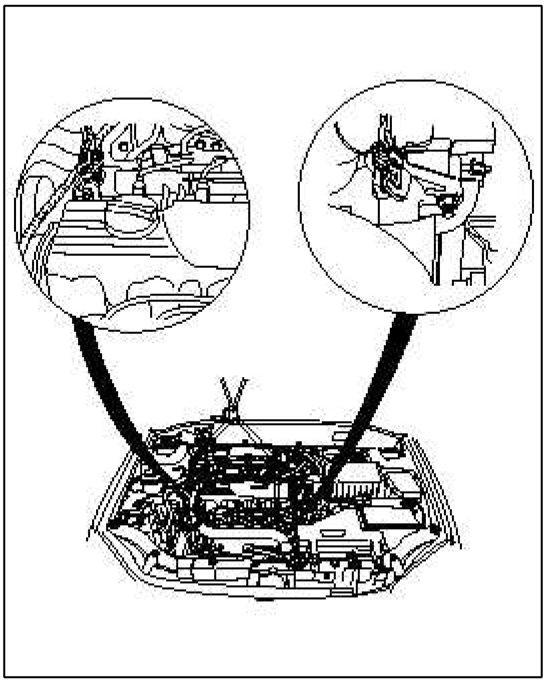


26. Disconnect the front exhaust pipe from the manifold.

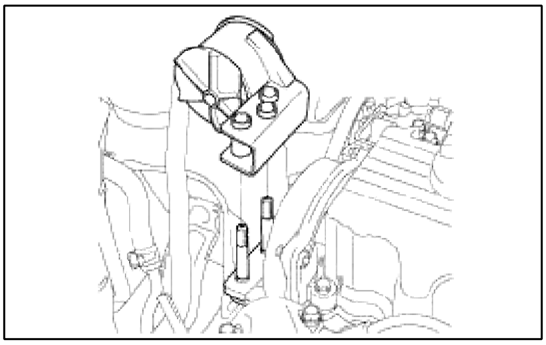


> NOTE
>
> Use wire to suspend the exhaust pipe from the bottom of the vehicle.

27. Attach chains or cables to the engine.
    Use an engine hoist or a chain hoist to slightly raise the engine (enough to support the engine's wieght while continning with the following steps.)

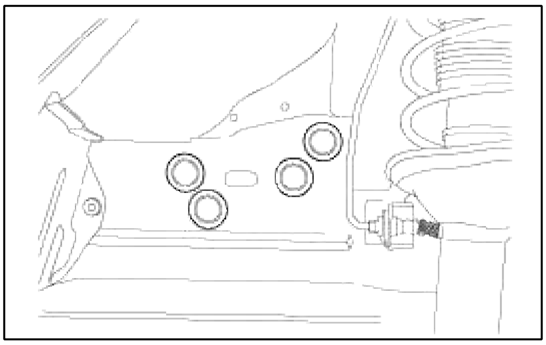


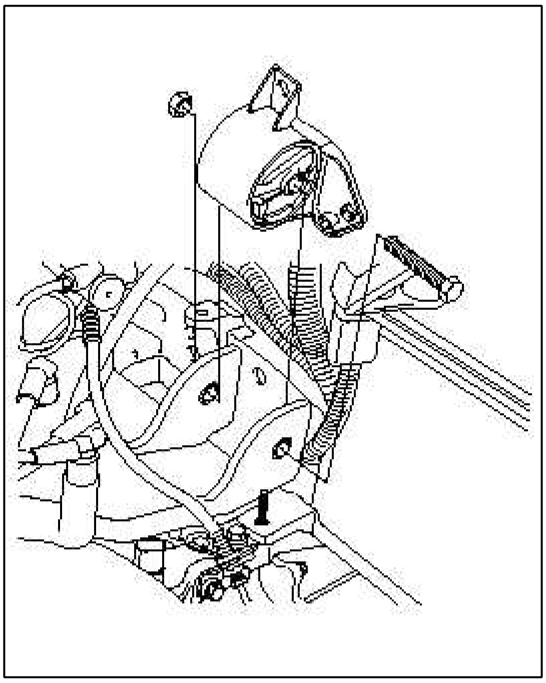
28. Remove the engine mounting bracket from the engine.



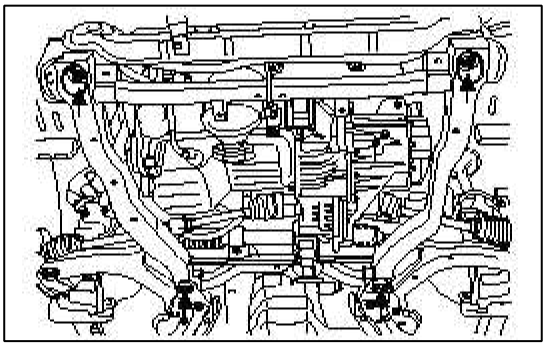
29. Slowly raise the engine (to the extent that the weight of the engine and transmission assembly is not applied to the mounting portions) and temporarily hold it in the raised position.

30. Remove the caps from the inside of the right fender shield and remove the transaxle mount bracket bolts.





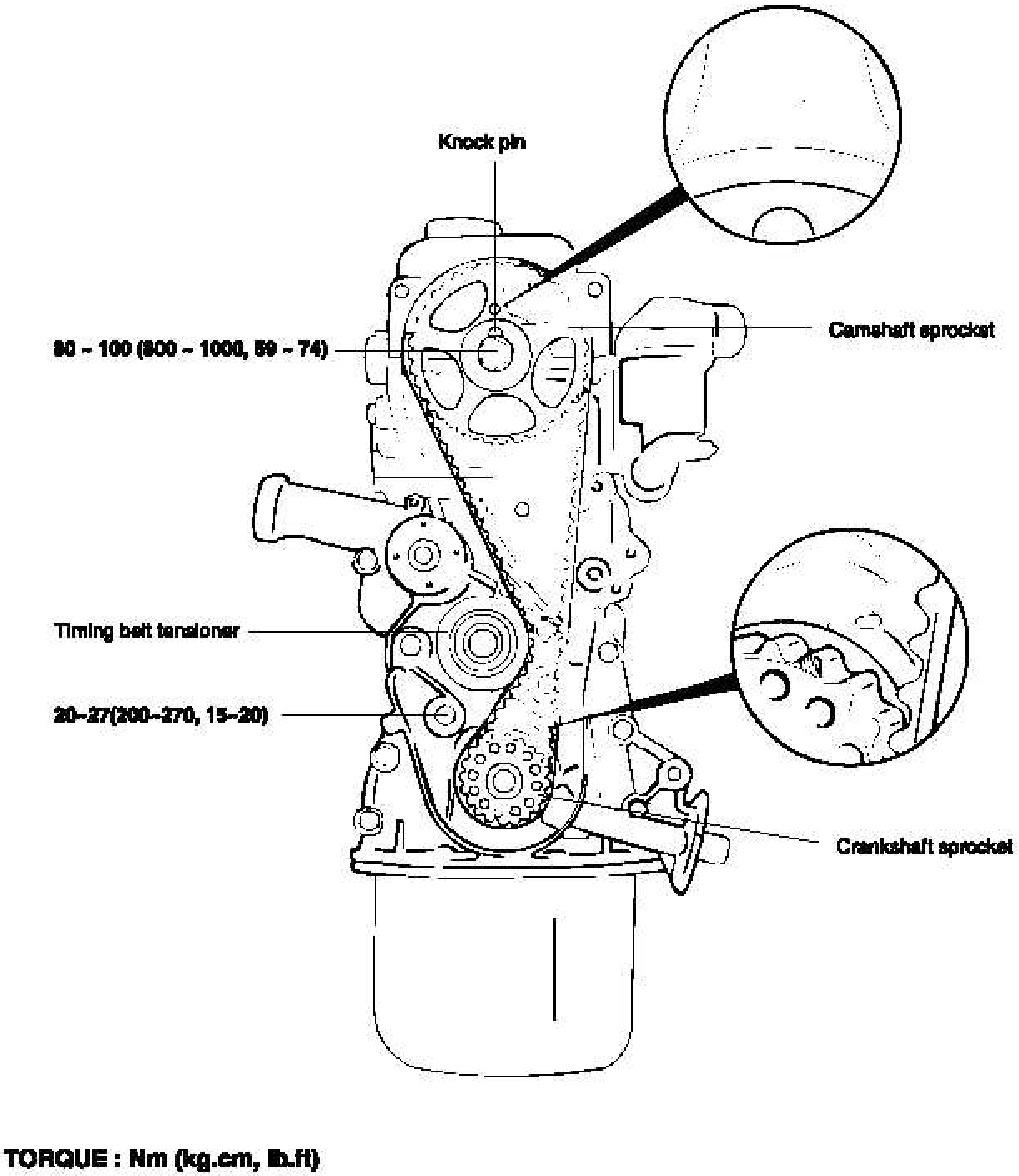
31. Remove the cross member fixing bolts and nuts.



32. While directing the transmission side downward, lift the engine and transmission assembly down and out of the vehicles.

Engine Mechanical System > Timing System > Timing Belt > Components and Components Location

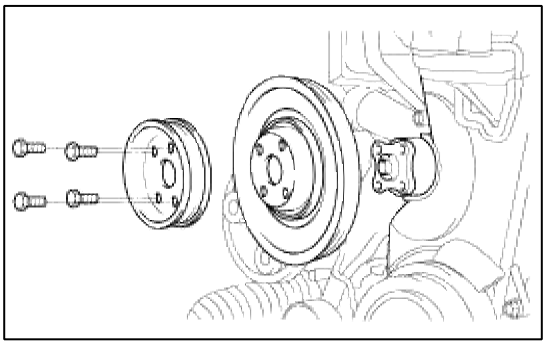
COMPONENTS


Knock pin
80 ~ 100 (800 ~ 1000, 59 ~ 74)
Camshaft sprocket
Timing belt tensioner
20~27(200~270, 15~20)
Crankshaft sprocket
TORQUE : Nm (kg.cm, lb.ft)

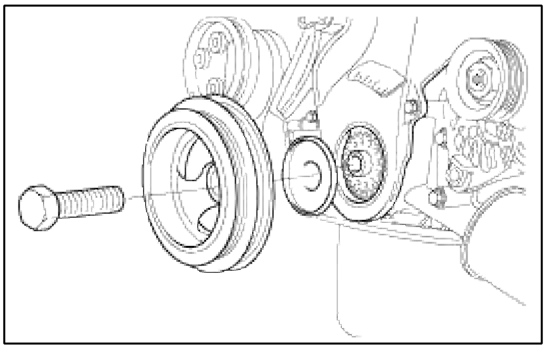
Engine Mechanical System > Timing System > Timing Belt > Repair procedures

DISAESSEMBLY

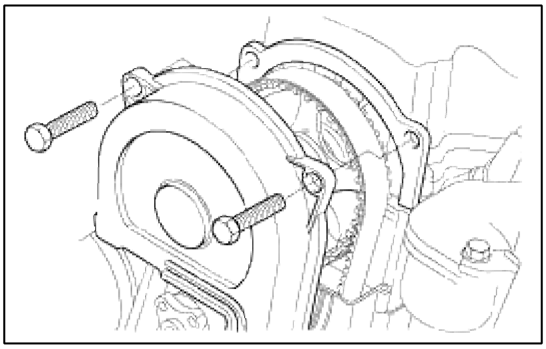
1. Loosen the coolant pump pulley bolts.



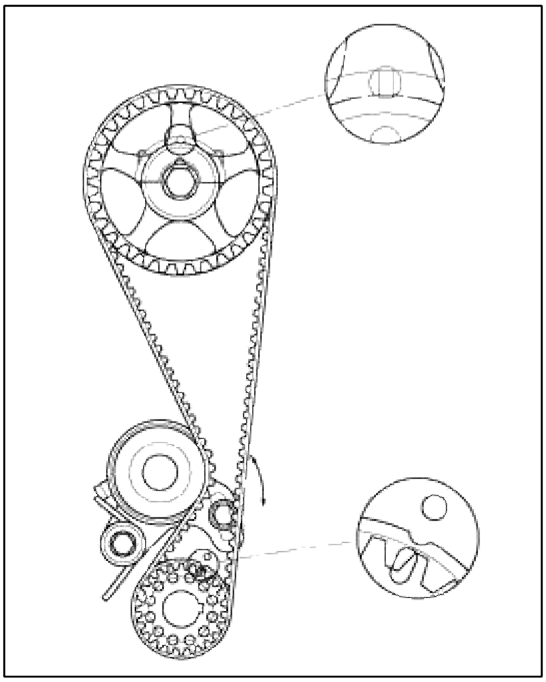
2. Loosen the alternator bolt.
3. Remove the coolant pump pulley and belt.
4. Remove the crankshaft pulley.



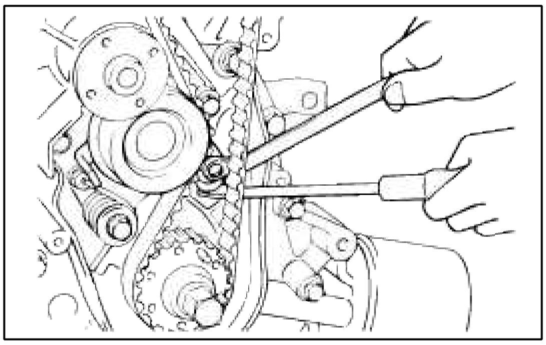
5. Remove the timing belt cover.



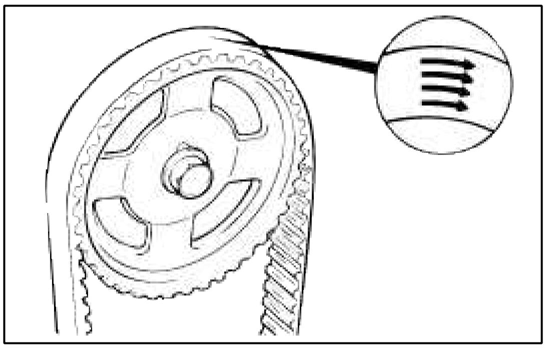
6. Align the timing marks of the camshaft sprocket and crankshaft sprocket, with the No.1 piston placed at top dead center on its compression stroke.



7. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.



8. Remove the timing belt.

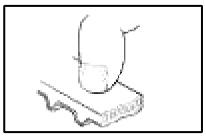
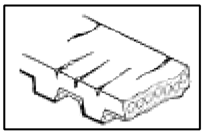
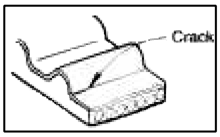
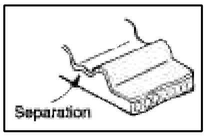


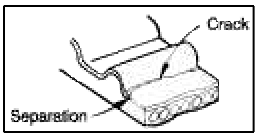
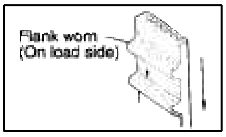
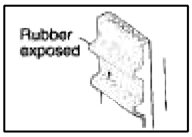
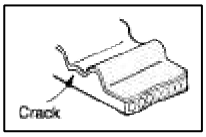
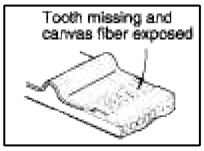
9. Remove the camshaft sprocket.
10. Remove the crankshaft sprocket bolts. Remove the crankshaft sprocket and flange.
11. Remove the timing belt tensioner.

INSPECTION

TIMING BELT

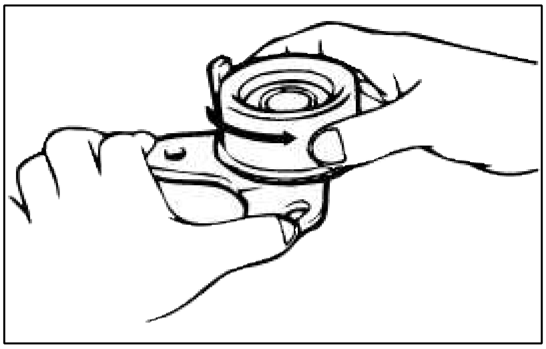
1. Check the belt for oil or dust deposits. Replace, if necessary. Small deposits should be wiped away with a dry cloth or paper. Do not clean with solvent.
2. When the engine is overhauled or belt tension adjusted, carefully check the belt. If any of the following flaws are evident, replace the belt.

Description	Flaw conditions
1. Hardened back surface Back surface glossy. Non-elastic and so hard that when your fingernail is pressed into it, no mark is produced.	
2. Cracked back surface rubber	
3. Cracked or separating canvas	
	

	 Crack Separation
4. Badly worn teeth (initial stage) Canvas on load side tooth flank worn (Fluffy canvas fibers, rubber gone and color changed to white, and unclear canvas texture)	 Flank worn (On load side)
5. Badly worn teeth (last stage) Canvas on load side tooth flank worn down and rubber exposed (tooth width reduced)	 Rubber exposed
6. Cracked tooth bottom	
7. Missing tooth	 Tooth missing and canvas fiber exposed
8. Side of belt badly worn NOTE A normal belt should have precisely cut sides as if cut by a sharp knife.	
9. Side of belt cracked	

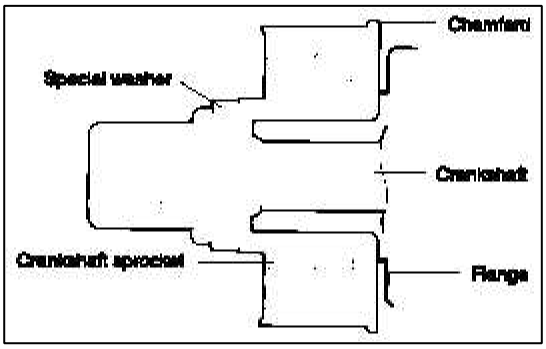
SPROCKETS AND TENSIONER

1. Check the camshaft sprocket, crankshaft sprocket, tensioner pulley, and idler pulley for abnormal wear, cracks, or damage. Replace as necessary.
2. Inspect the tensioner pulley and the idler pulley for easy and smooth pulley rotation, play or noise. Replace as necessary.



REASSEMBLY

1. Install the flange and crankshaft sprocket as shown.
   Pay close attention to their mounting directions.

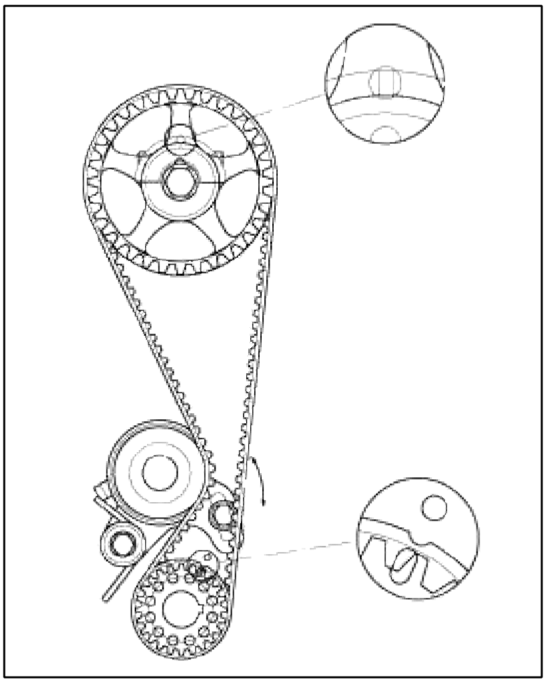


Tightening torque
Crankshaft sprocket bolt :
140 ~150Nm (1400 ~ 1500kg.cm, 103 ~ 111lb.ft)

2. Install the camshaft sprocket and tighten the bolt to the specified torque.

Tightening torque
Camshaft sprocket bolt :
80 ~ 100 Nm (800 ~ 1000 kg.cm, 59 ~ 74 lb.ft)

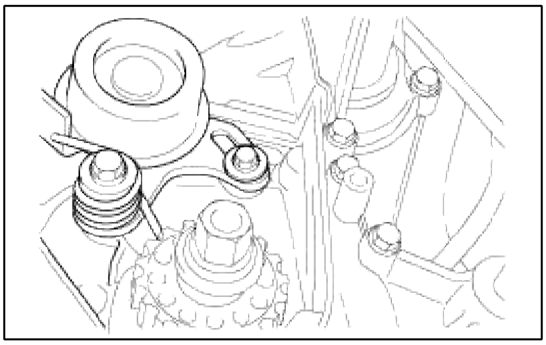
3. Align the timing marks of the camshaft sprocket and crank shaft sprocket, with the No.1 piston placed at top dead center on its compression stroke.



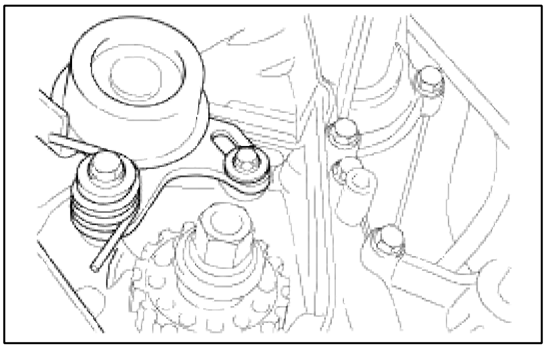
NOTE

When installing camshaft sprocket.
Make sure that cmashaft sprocket knock pin fits small hole in pulley as shown.

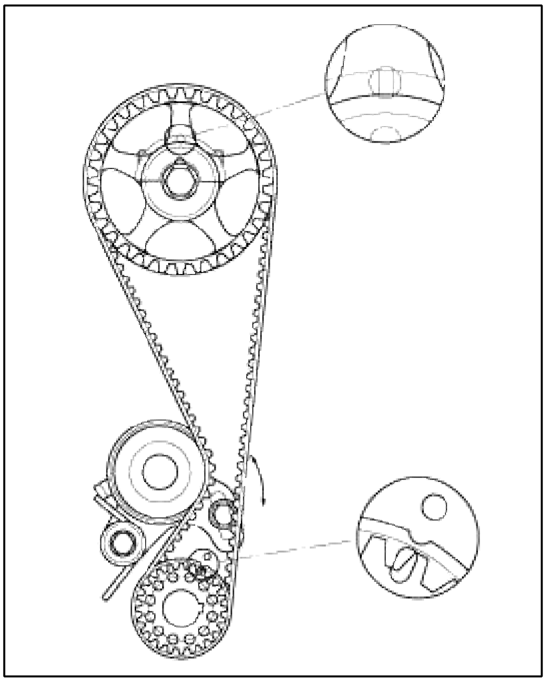
4. Tentatively fasten the timing belt tensioner where its pulley is nearest the water pump body.



5. Hang the tensioner spring on the tensioner bracket and insert the other side into the front case using a screw driver.



6. Install the timing belt tightly in the sequence shown.
   ①Crankshaft sprocket → ②Camshaft sprocket → ③Timing belt tensioner.

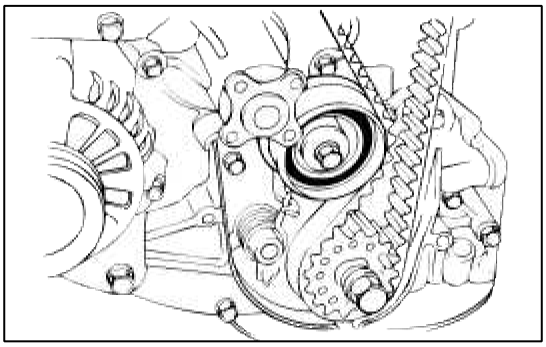


7. Install timing belt so as not to give salck to tension side.

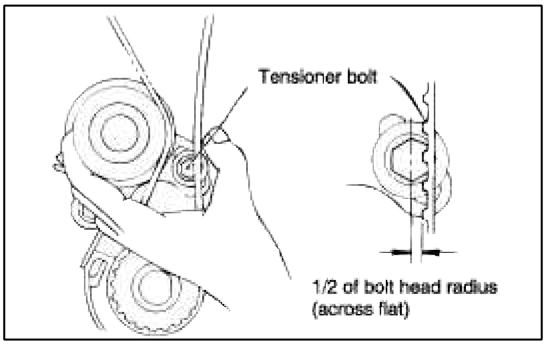
NOTE

Then make sure that timing marks are at correct position respectively with tension side in strained state by applying force to camshaft sprocket in reversing direction.

8. Loosen the tensioner mounting bolt in the order as shown to give the timing belt spring tension.



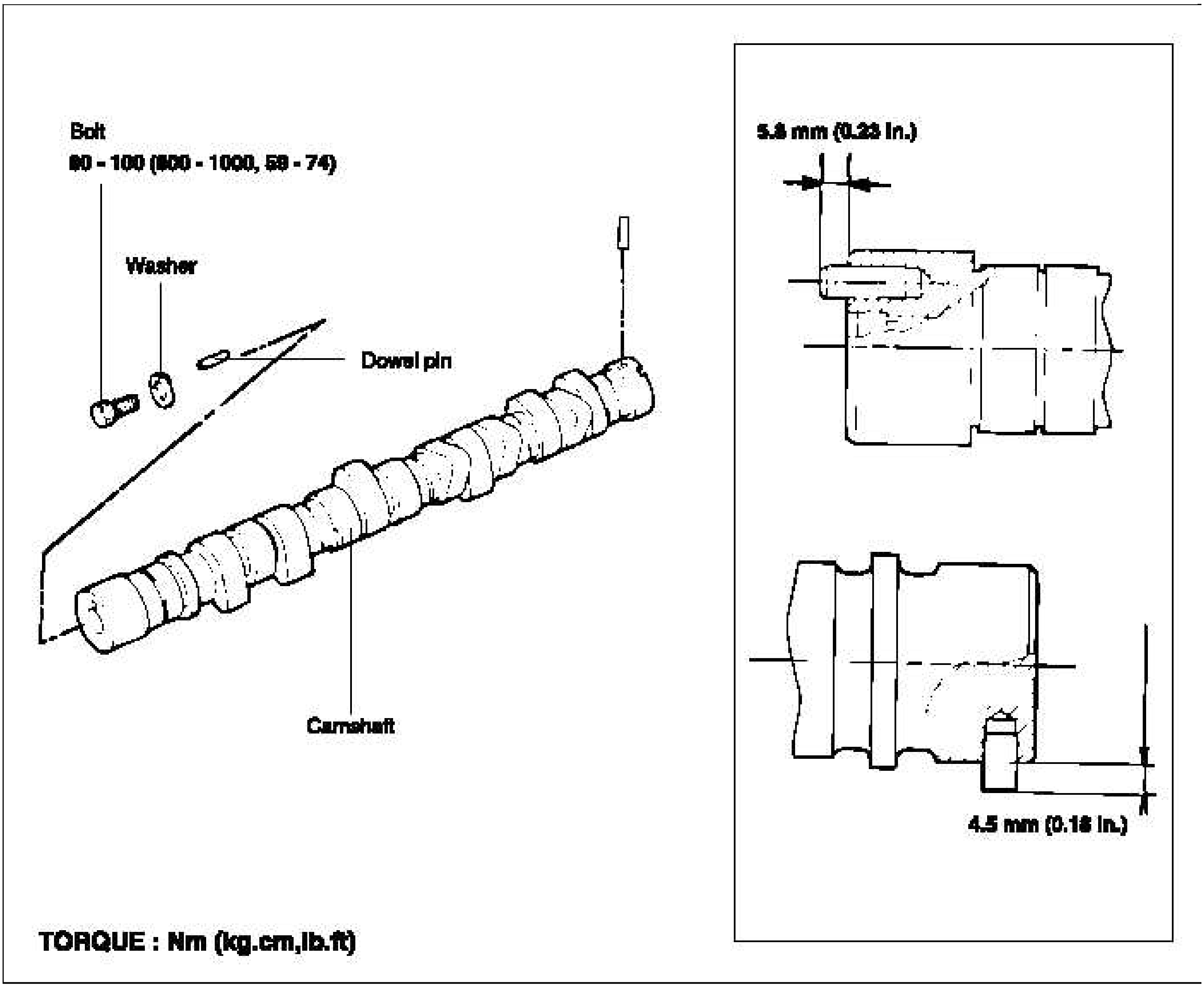
9. Rotate crankshaft in regular direction (clockwise view from front) through angle equivalent to two teeth (15°) of camshaft sprocket.
10. Add force to tensioner in direction of regular rotation (→ direction) to bring belt teeth in perfect contact with sprocket teeth without a gap.
11. After making sure of this state.
    Fix tensioner so that only the tensioner spring is movable.
12. Rotate the crankshaft pulley two or four turns conter clockwise so that the timing belt positions itselt on the sprockets.
13. Recheck the belt tension. Verify that when the tensioner and the tension side of the timing belt are pushed in horizontally with a moderate force [approx. 49N (11 lb)], the timing belt is half of the tensioner mounting bolt head radius away from the bolt head center.



14. Install the timing belt cover.
15. Install the crankshaft pulley.
16. Install the A/C compressor belt and adjust the belt tension.
17. Install the coolant pump pulley.
18. Install the V-belt and adjust the belt tension.

Engine Mechanical System > Cylinder Head Assembly > Camshaft > Components and Components Location

COMPONENTS

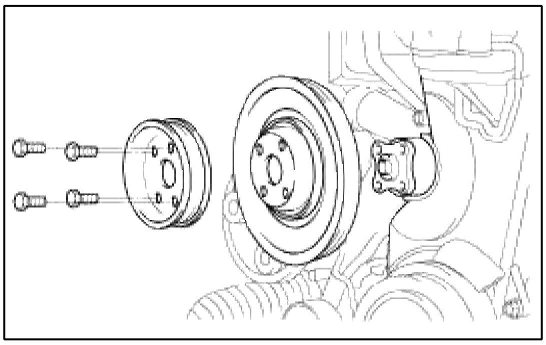

Bolt
80 - 100 (800 - 1000, 59 - 74)
Washer
Dowel pin
Camshaft
TORQUE : Nm (kg.cm,lb.ft)
5.8 mm (0.23 in.)
4.5 mm (0.18 in.)

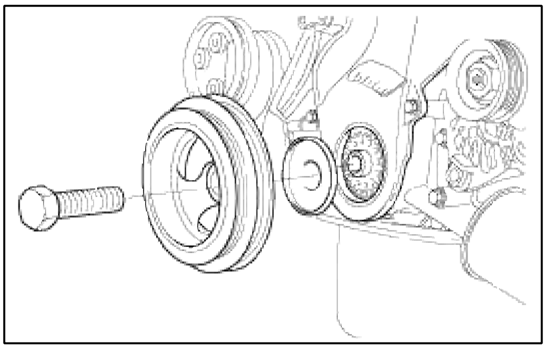
Engine Mechanical System > Cylinder Head Assembly > Camshaft > Repair procedures

DISASSEMBLY

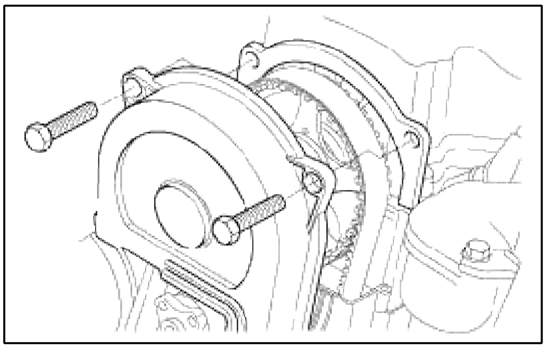
1. Disconnect the breather hose and the PCV hose.

2. Remove the coolant pump pulley and crankshaft pulley.

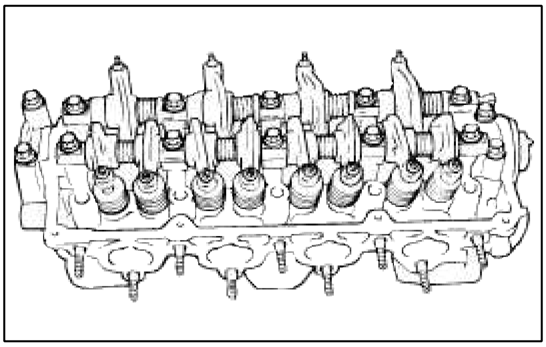




3. Remove the timing belt cover.

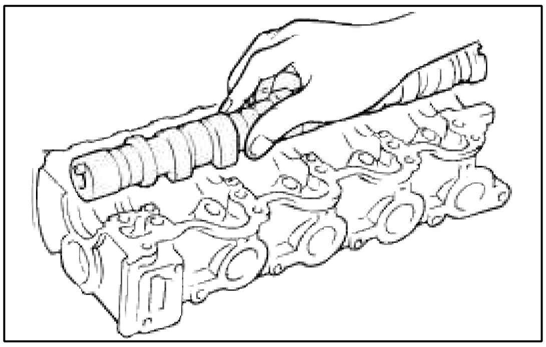


4. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.
5. Remove the timing belt from the camshaft sprocket.
6. Remove the camshaft sprocket.
7. Remove the rocker cover.
8. Remove the rocker arm shaft assembly, Refer to "Rocker Arms and Rocker Arm Shafts" section.



9. Remove the camshaft bearing caps.

10. Remove the camshaft.

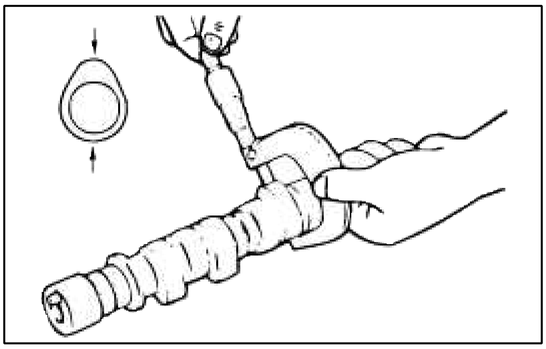


INSPECTION

CAMSHAFT

1. Check the camshaft journals for wear. If the journals are badly worn, replace the camshaft.
2. Check the cam lobes for damage. If the lobe is damaged or worn excessively, replace the camshaft.

Cam height
Standard value
Intake : 42.8575 mm (1.6873 in.)
Exhaust : 42.7354 mm (1.6825 in.)
Limit
Intake : 42.3575 mm (1.6676 in.)
Exhaust : 42.2353 mm (1.6628 in.)



3. Check the cam surface for abnormal wear or damage, and replace if necessary.
4. Check each bearing for damage. If the bearing surface is excessively damaged, Replace the cylinder head assembly or camshaft bearing cap, as necessary.

OIL SEAL (CAMSHAFT FRONT)

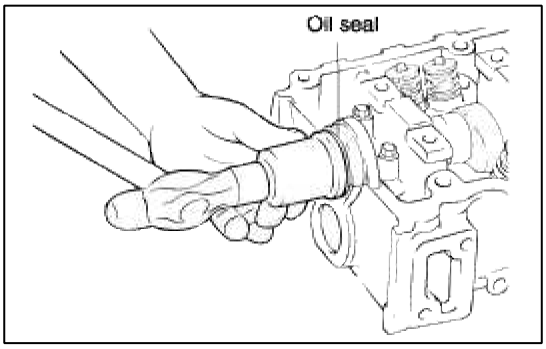
1. Check the lips for wear. If lip threads are worn, replace.
2. Check the oil seal lip contacting surface of the camshaft. If it is worn in stages, replace the camshaft.

Camshaft end play :
0.07 ~ 0.28 mm (0.0003 ~ 0.0011 in.)

REASSEMBLY

1. Install the camshaft after lubricating the journal of the camshaft with engine oil.
2. Install the camshaft bearing caps.
3. Install the rocker arm and rocker arm shaft.
   Refer to the "Rocker Arms and Rocker Arm Shafts" section.

4. Using the Special Tools, Camshaft Oil Seal Installer (09221-21000), press and fit the camshaft oil seal. Be sure to apply engine oil to the external surface of the oil seal.
   Insert the oil seal along the camshaft front end and install by driving the installer with a hammer until the oil seal is fully seated.

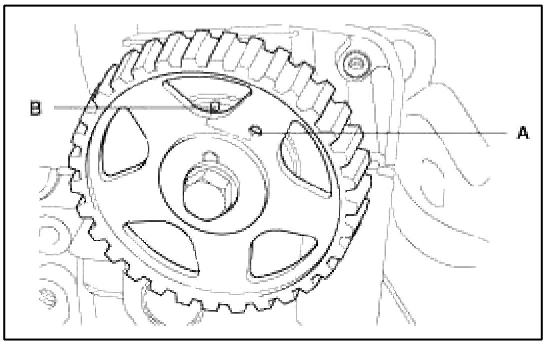


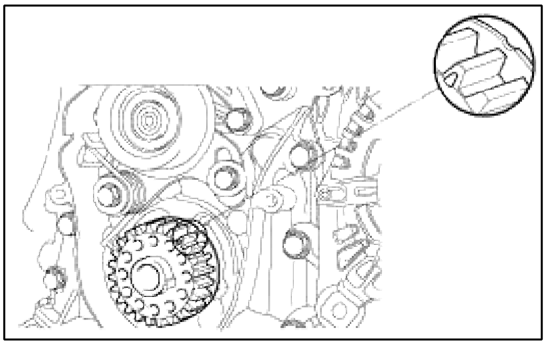
5. Install the camshaft sprocket and tighten the bolts to the specified torque.

Tightening torque
Camshaft sprocket bolt :
80 ~ 100 Nm (800 ~ 1000 kg.cm, 59 ~ 74 lb.ft)

---

6. Align the camshaft sprocket and crankshaft sprocket timing marks. The piston in the No. 1 cylinder will then be at top dead center on the compression stroke.





7. Intsall a gasket in the rocker cover groove.
8. Temporarily install the rocker cover.
9. Start the engine and run at idle.
10. Install the rocker cover and tighten the bolts to the specified torque.

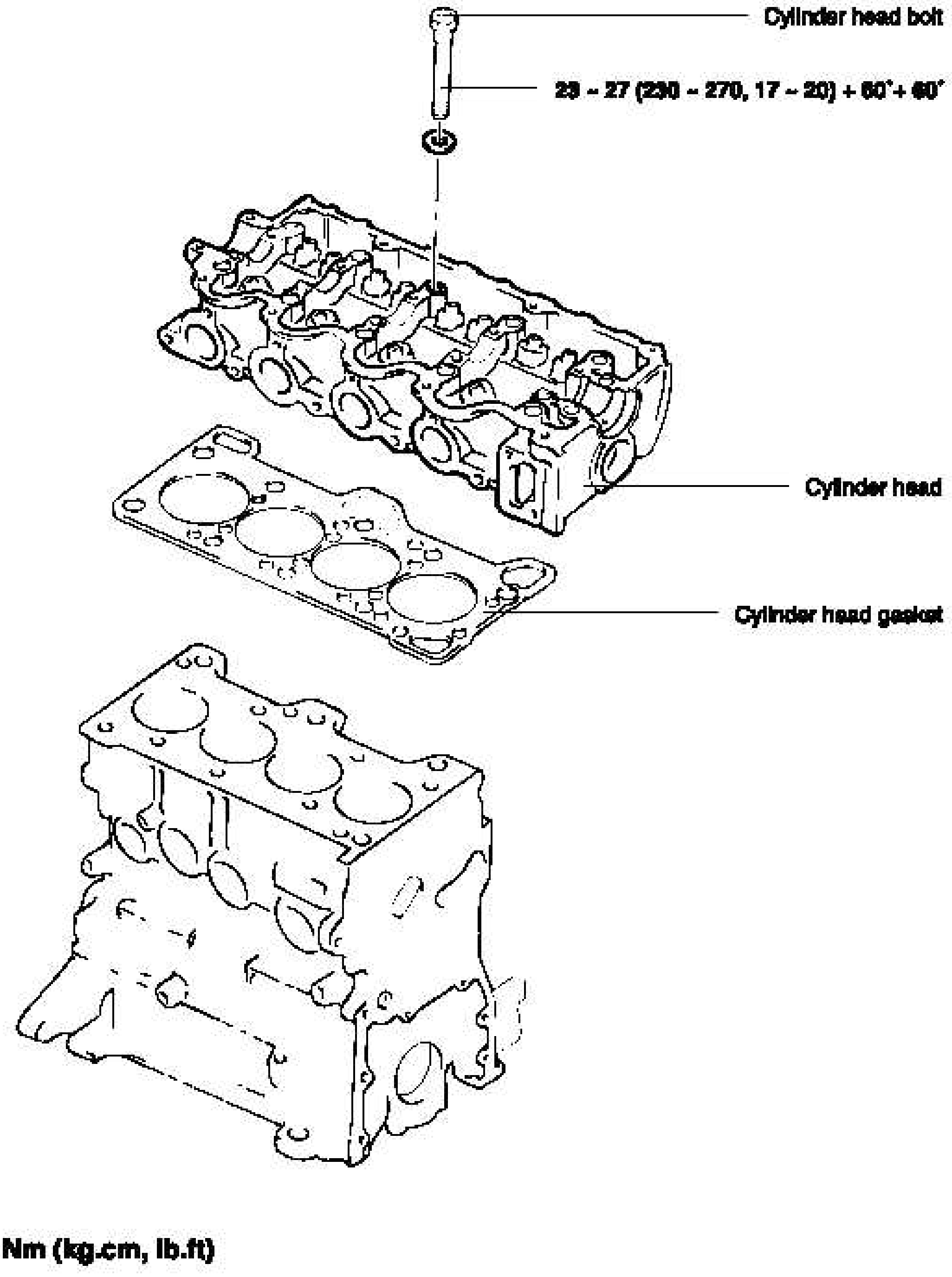
Tightening torque
Rocker cover bolt : 8~10Nm (80~100 kg.cm, 6~7 lb.ft)

---

11. Install the timing belt cover.
12. Install the coolant pump pulley and crankshaft pulley.

Engine Mechanical System > Cylinder Head Assembly > Valve > Components and Components Location

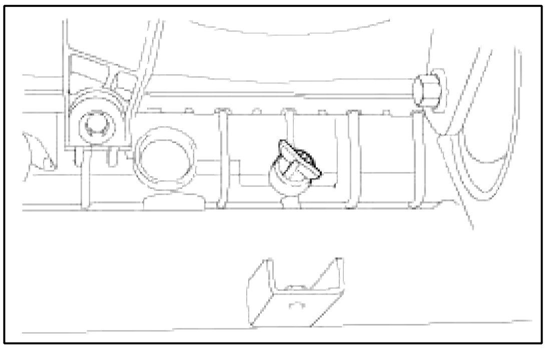
COMPONENTS


Cylinder head bolt
23 ~ 27 (230 ~ 270, 17 ~ 20) + 60°+ 60°
Cylinder head
Cylinder head gasket
TORQUE : Nm (kg.cm, lb.ft)

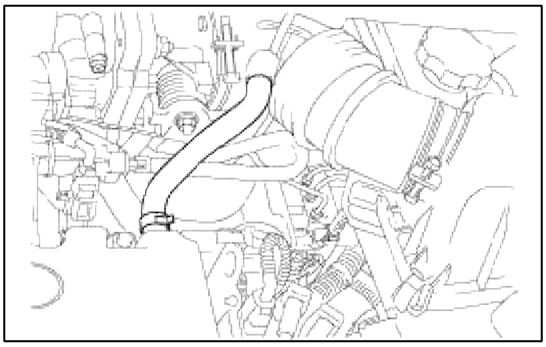
Engine Mechanical System > Cylinder Head Assembly > Valve > Repair procedures

DISASSEMBLY

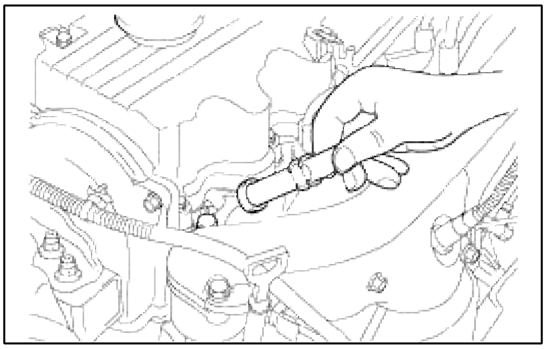
1. Drain the coolant and disconnect the upper radiator hose.



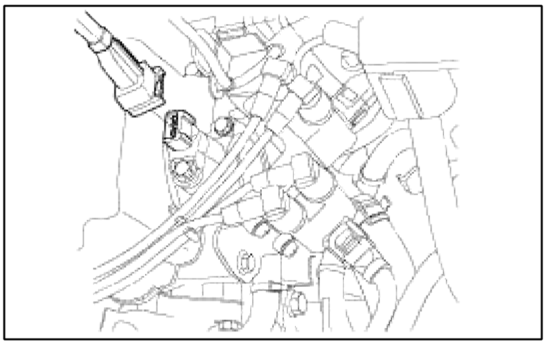
2. Remove the breather hose. (between the air cleaner and the rocker cover)



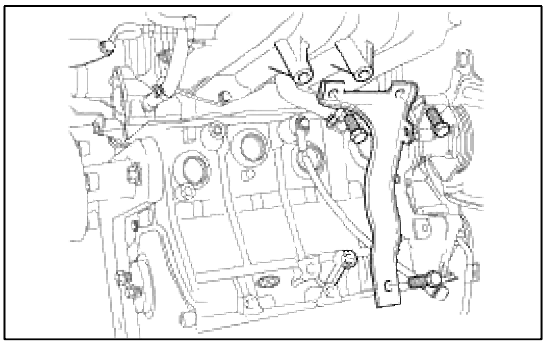
3. Remove the air intake hose.
4. Remove the vacuum hose, fuel hose and coolant hose.
5. Remove the cables from the spark plugs. The cables should be removed by holding the boot portion.



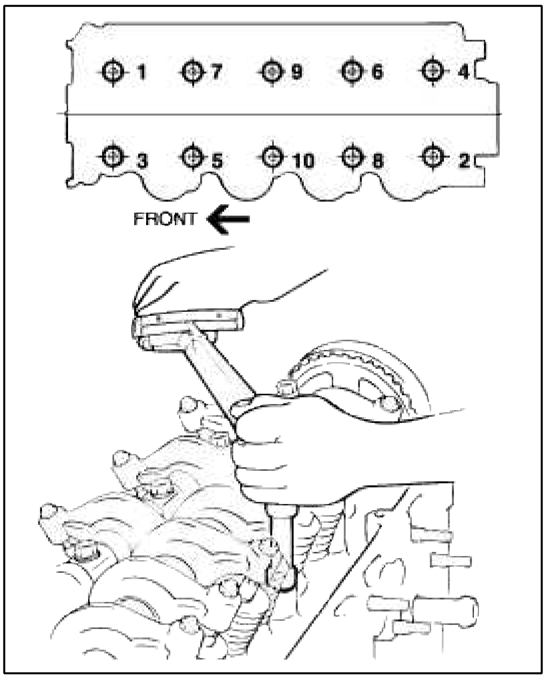
6. Remove the ignition coil.



7. Remove the surge tank bracket.



8. Remove the intake manifold.
9. Remove the heat protector and exhaust manifold assembly.
10. Remove the coolant pump pulley and the crankshaft pulley.
11. Remove the timing belt cover.
12. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.
13. Remove the timing belt.
14. Remove the rocker cover.
15. Remove the cylinder head assembly. The cylinder head bolts should be removed using Cylinder Head Bolt Wrench, in the sequence as shown in the illustration.



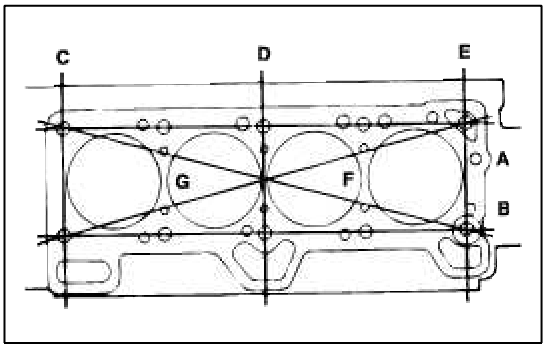
16. Remove the gasket pieces from the cylinder block top surface and cylinder head bottom surface.

> **NOTE**
>
> Make sure that the gasket pieces do not fall in to the engine.

INSPECTION

1. Check the cylinder head for cracks, damage and coolant leakage.
2. Remove scale, sealing compound and carbon deposits completely. After cleaning oil passages, apply compressed air to make certain that the passages are not clogged.

3. Check the cylinder head surface for flatness using a straight edge in the direction of A, B, ...as shown.



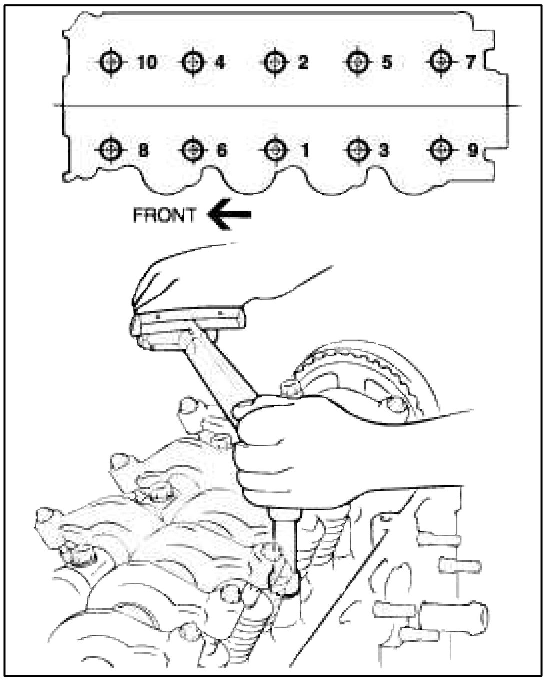
If flatness exceeds service limit in any direction, replace the cylinder head, or lightly machine the cylinder head surface.

Cylinder head flatness
Standard value : Less than 0.03 mm (0.012 in.)
Limit : 0.08 mm (0.0031 in.)

REASSEMBLY

1. Clean all gasket surfaces of the cylinder block and the cylinder head.
2. Install a new cylinder head gasket onto the cylinder head assembly. Do not apply sealant to the gasket and do not reuse the old cylinder head gasket.
3. Install the cylinder head bolts. Starting at top center. Tighten all cylinder head bolts in sequence as shown in illustration, using the Cylinder Head Bolt Wrench. Repeat the procedure, retightening all cylinder head bolt to the specified torque.

Tightening torque
23~27Nm (230~270kg.cm, 17~20lb.ft)+60°+60°



4. Move the timing belt tensioner pulley toward the coolant pump and temporarily secure it.
5. Install the timing belt on the camshaft sprocket, making sure that the tension side is tightened by turning the camshaft sprocket in reverse. Make sure all timing marks are in alignment.
6. Adjust the timing according to the "Timing Belt" section.

7. Install the rocker cover and tighten the bolts to the specified torque.

Tightening torque
Rocker cover bolt :
8 ~ 10 Nm (80 ~ 100 kg.cm, 6 ~ 7 lb.ft)

8. Install the timing belt cover.
9. Install the new intake manifold gasket and the intake manifold. Tighten the nuts and bolts to the specified torque.

Tightening torque
Manifold nuts and bolts (both intake and exhaust) :
15 ~ 20 Nm (150 ~ 200 kg.cm, 11 ~ 15 lb.ft)

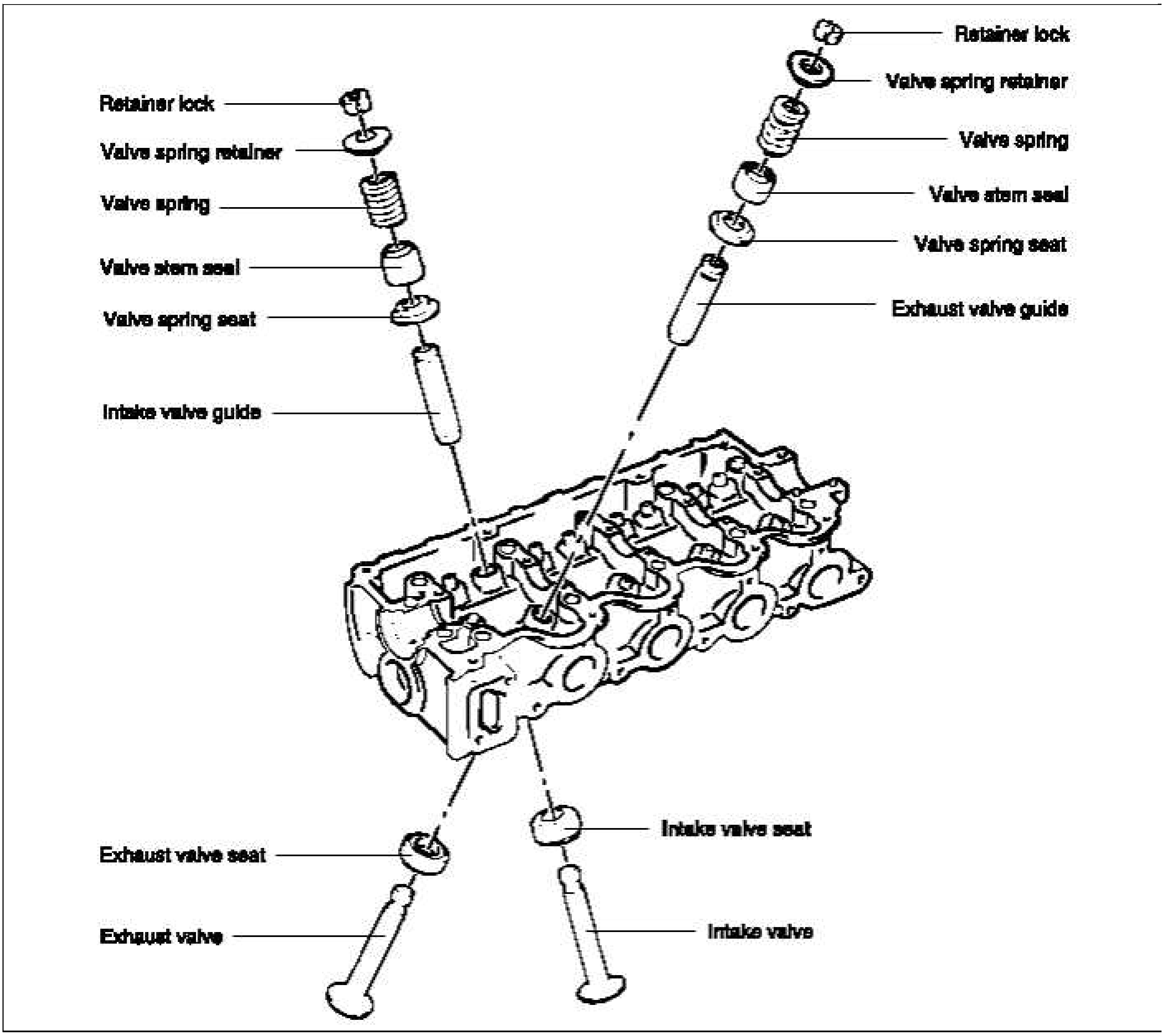
10. Install the new exhaust manifold gasket and the exhaust manifold. Tighten the exhaust manifold attaching nuts to the specified torque.
11. Install the surge tank and tighten the nuts and bolts to the specified torque.

Tightening torque
Surge tank to inlet manifold nuts and bolts :
15 ~ 20 Nm (250 ~ 200 kg.cm, 11 ~ 15 lb.ft)

12. Install the ignition coil.
13. Install the air intake hose.
14. Connect the vacuum hose, fuel hose and coolant hose.
15. Install breather hose.

Engine Mechanical System > Cylinder Head Assembly > Cylinder Head > Components and Components Location

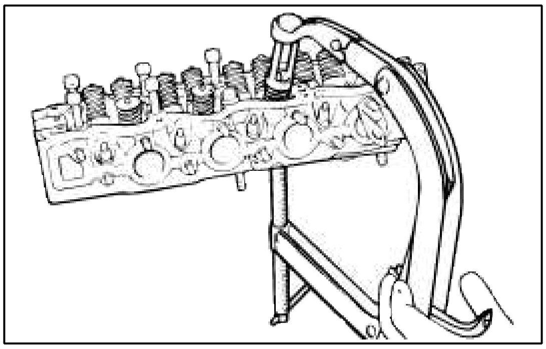
COMPONENTS


Retainer lock
Valve spring retainer
Valve spring
Valve stem seal
Valve spring seat
Intake valve guide
Retainer lock
Valve spring retainer
Valve spring
Valve stem seal
Valve spring seat
Exhaust valve guide
Intake valve seat
Exhaust valve seat
Exhaust valve
Intake valve

Engine Mechanical System > Cylinder Head Assembly > Cylinder Head > Repair procedures

DISASSEMBLY

1. Using the special tool, valve spring remover and installer, remove the retainer lock. Next, remove the spring retainer, vlave spring, spring seat and valve.



NOTE

Keep these parts in order so that they can be rein-stalled in their original positions.

2. Remove the valve stem seals with pliers, and discard them.

> **NOTE**
>
> Do not reuse the valve stem seals.

INSPECTION

VALVE SPRING

1. Check the valve spring free length and tension. If they exceed the service limit, replace the spring.
2. Using a square, test the squareness of each spring.
   If a spring is excessively out of square, replace it.

VALVE SPRING

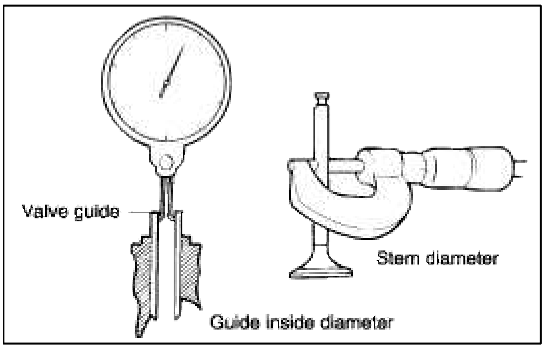
Standard vlaue
Free height : 42.03 mm (1.655 in.)
Load : 24.7 kg at 34.5 mm
Out of square : 1.5° or less

VALVE GUIDES

Check the valve stem-to-guide clearance. If the clearance exceeds the service limit, replace the vlave guide with the next oversize part.

VALVE STEM-TO-GUIDE CLEARANCE

Standard vlaue
Intake : 0.030 ~ 0.060 mm (0.0012 ~ 0.0024 in.)
Exhaust : 0.035 ~ 0.065 mm (0.0014 ~ 0.0026 in.)



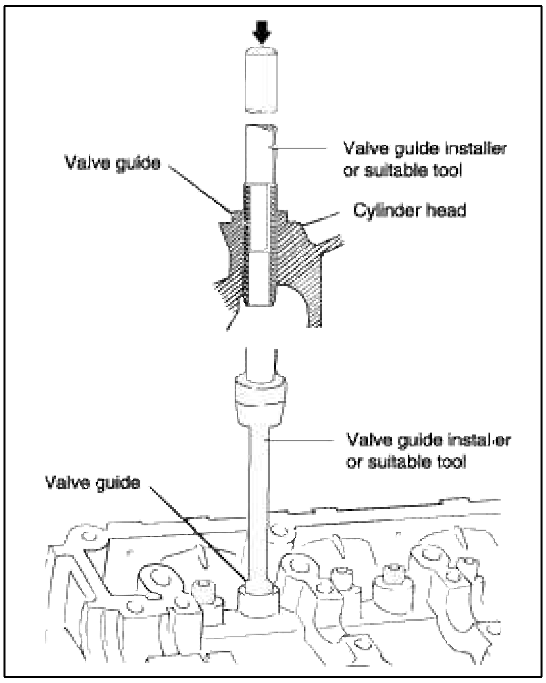
VALVE GUIDE OVERSIZES

Size mm (in.)	Size mark	Cylinder head hole size mm (in.)
0.05 (0.002) O.S.	5	11.05 ~ 11.068 (0.435 ~ 0.4357)
0.25 (0.010) O.S.	25	11.25 ~ 11.268 (0.4429 ~ 0.4436)
0.50 (0.020) O.S.	50	11.50 ~ 11.518 (0.4528 ~ 0.4534)

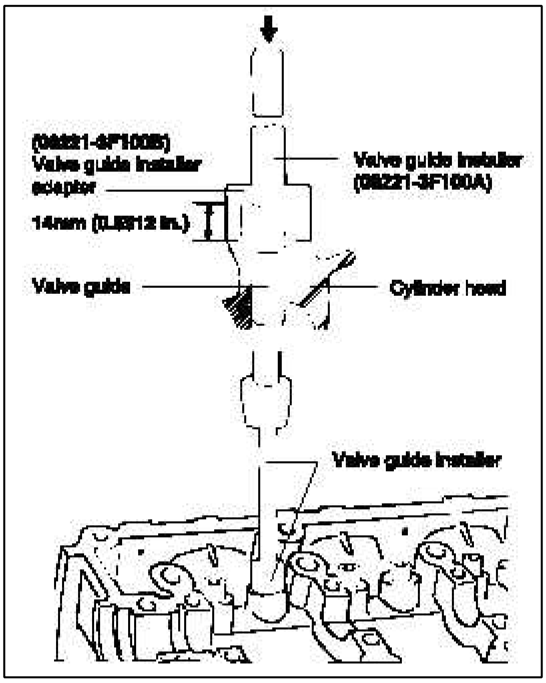
VALVE GUIDE REPLACEMENT PROCEDURES

The valve guide is installed using a press fit. Using Value Guide installer (09221- 3F100 A/B) or suitable tool, replace the valve guide described in the following procedure.

1. Using the valve guide installer push rod, push the valve guide out toward the cylinder block with a press.

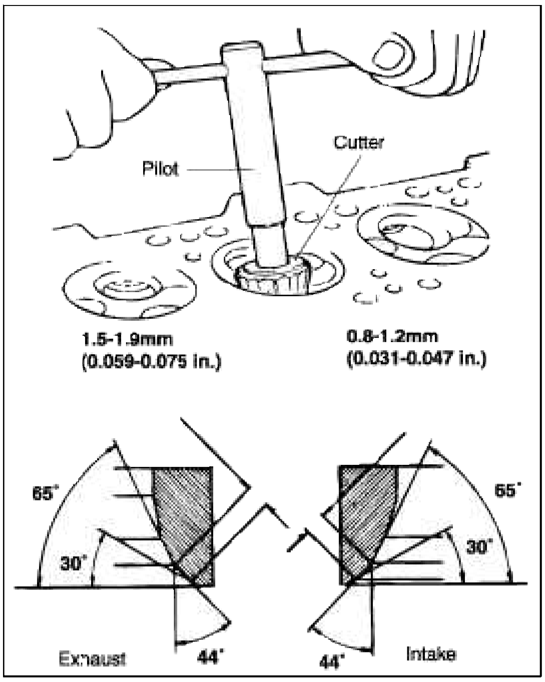

Valve guide
Valve guide installer or suitable tool
Cylinder head
Valve guide installer or suitable tool
Valve guide

2. Machine the valve guide insert hole in the cylinder head to the specified oversize of the new valve guide.
3. Using the valve guide installer or suitable tool, press fit the valve guide. Using the vlalve guide installer makes it possinle to press fit the valve guide to a predetermined height. Install the vlave guide from the top of the cylinder head. Note that intake and exhaust valve guides differ in length.
4. After installing the valve guides, insert new valves and check the clearance.


(09221-3F100B)
Valve guide installer adapter
14mm (0.5512 in.)
Valve guide installer (09221-3F100A)
Valve guide
Cylinder head
Valve guide installer

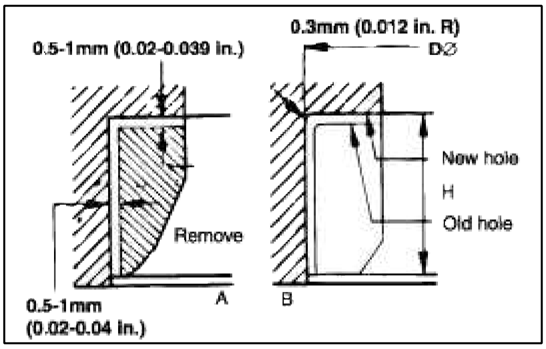
5. Whenever valve guides are replaced, check for valve-to-seat contact, and recondition the valve seats as necessary.

VALVE SEAT INSERT


Pilot
Cutter
1.5-1.9mm
(0.059-0.075 in.)
0.8-1.2mm
(0.031-0.047 in.)
65°
30°
65°
30°
Exhaust
44°
44°
Intake

VALVE SEAT INSERT REPLACEMENT PROCEDURE

1. Any valve seat insert that has been worn over the service limit should be removed at normal temperature after cutting away most of the insert wall, using valve seat cutters, as shown in Fig A.
2. After removing the seat insert, machine the seat insert bore using a reamer or a cutter. Cut to the size shown in the table.
3. Heat the cylinder head to about 250°C (480°F) and press in the oversize seat insert. The oversize seat insert should be at normal room temperature for installation. After installing a new valve seat insert, resurface the valve seat using the same procedure described in the first paragraph of "Valve Seat Insert" (above).

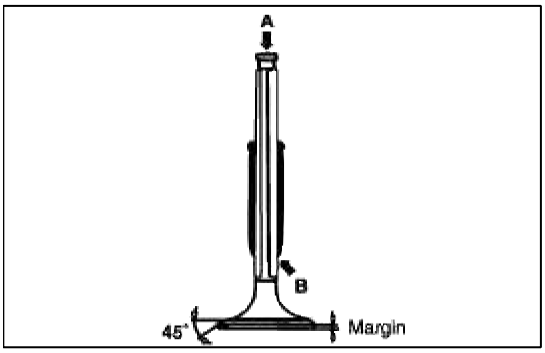

0.3mm (0.012 in. R)
DØ
0.5-1mm (0.02-0.039 in.)
New hole
H
Old hole
Remove
0.5-1mm
(0.02-0.04 in.)
A
B

VALVE SEAT INSERT OVERSIZES

Description	Size mm (in.)	Size mark	Seat insett height H mm (in.)	Cylinder head I.D. mm (in.)
Intake valve seat insert	0.3 (0.012) O.S.	30	5.1~5.3 (0.201~0.2069)	28.80~28.821(1.134~1.135)
	0.6(0.024) O.S.	60	5.4~5.6 (0.213~0.220)	29.10~29.121(1.146~1.147)
Exhaust valve seat insert	0.3 (0.012) O.S.	30	5.9~6.1 (0.232~0.240)	34.30~34.325(1.350~1.351)
	0.6 (0.024) O.S.	60	6.2~6.4(0.244~0.252)	34.60~34.625(1.362~1.363)

VALVES

Check each valve for wear, damage and distortion of head and stem (B). Repair or correct, if necessary. If stem end (A) is pitted or worn, resurface. This correction must be limited to a minimum. Also, resurface the valve face.



MARGIN

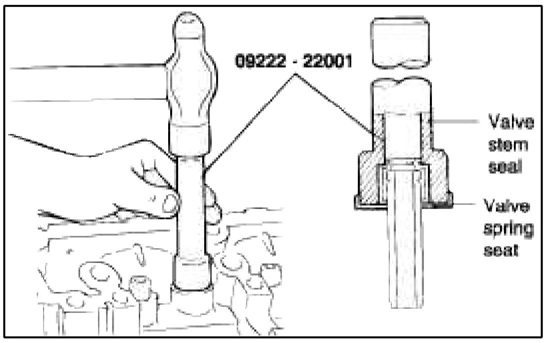
Standard value
Intake : 1.1 mm (0.043 in.)
Exhaust : 1.4 mm (0.055 in.)
Limit
Intake : 0.8 mm (0.031 in.)
Exhaust : 1.1 mm (0.043 in.)

REASSEMBLY

NOTE

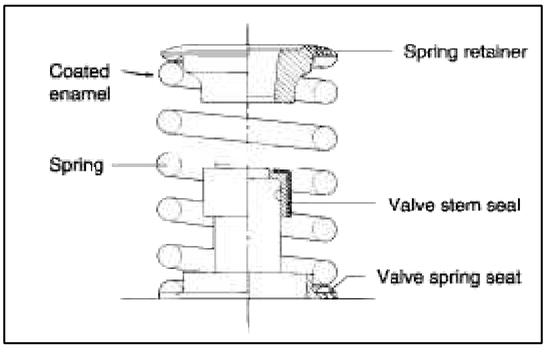
1. Thoughly clean each part before assembly.
2. Apply engine oil to sliding and rotating parts.

1. After installing the spring seat, fit the stem seal into the valve guide.
   To install, fit the seal in by lightly tapping the Special Tool, Valve Stem Oil Seal Installer.
   The seal is installed in the specified position by means of the special tool. Incorrect installation of the seal will adversely affect the lip I.D. and eccentricity, resulting in oil leaking down the valve guides. Therefore, when installing, be careful not to twist the seal. Do not reuse old stem seals.

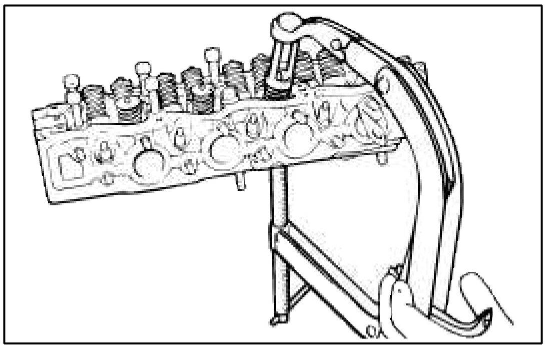
   

2. Apply engine oil to each valve. Insert the valves into the valve guides. Avoid using force when inserting the valve into the seal. After insertion, check to see if the valve moves smoothly.

3. Install springs and spring retainers. Valve springs should be installed with the enamel coated side toward the valve spring retainer.
   Valve springs should be installed with the enamel coated side toward the valve spring retainer.



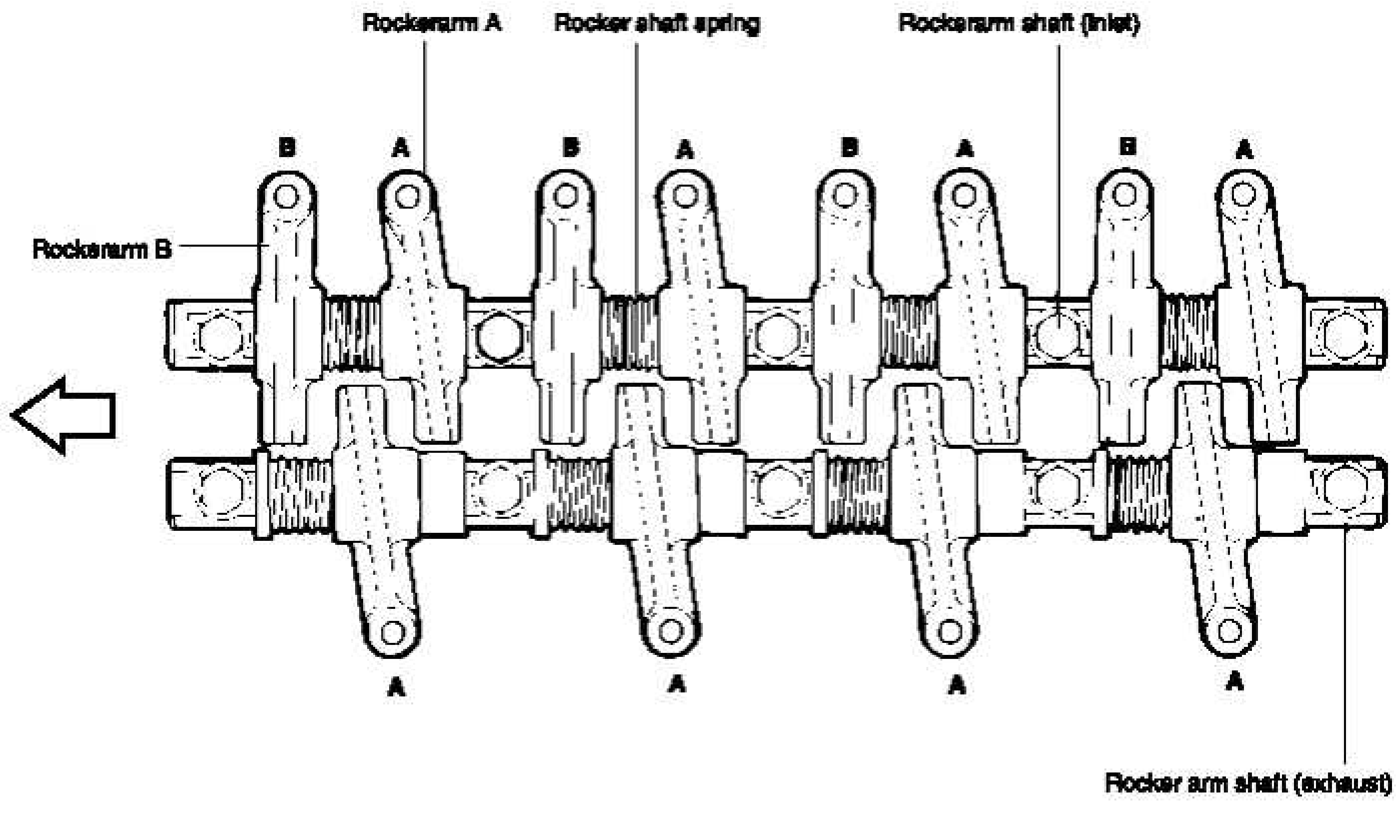
4. Using special tool, valve spring remover and installer, compress the spring. Be careful that the valve stem seal is not distorted by the bottom of the retainer. Then install the retainer locks. After installation of the valves, make certain that the retainer locks are properly installed.



5. Install the cylinder head. Refer to "Cylinder Head".

Engine Mechanical System > Cylinder Head Assembly > Rocker Arm > Components and Components Location

COMPONENTS

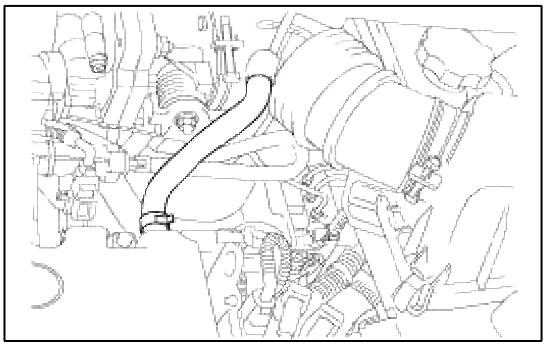

Rockerarm A
Rocker shaft spring
Rockerarm shaft (inlet)
B
A
B
A
B
A
B
A
Rockerarm B
A
A
A
A
Rocker arm shaft (exhaust)

TORQUE : Nm (kg-cm, lb-ft)

Engine Mechanical System > Cylinder Head Assembly > Rocker Arm > Repair procedures

DISASSEMBLY

1. Remove the breather hose and PCV valve.



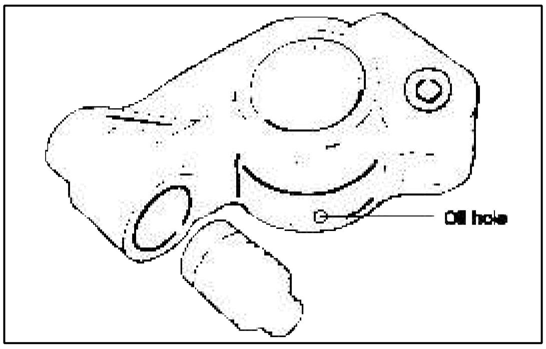
2. Remove the timing belt cover.
3. Remove the rocker cover.
4. Loosen the flange bolts and remove the rocker arm shaft, rocker arms and rocker arm shaft springs as an assembly.
5. Remove the bolts, the rocker arms and arm shaft springs from the rocker arm shaft.

INSPECTION

ROCKER ARM

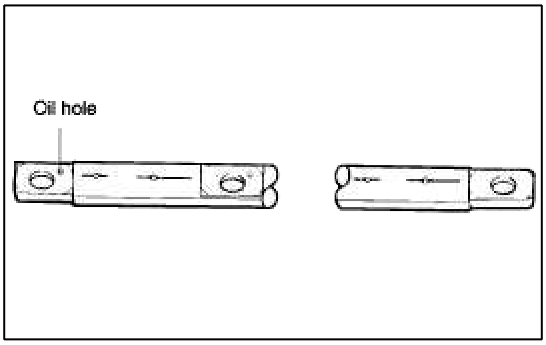
1. Check the rocker face.
   Replace it damaged or pressed.

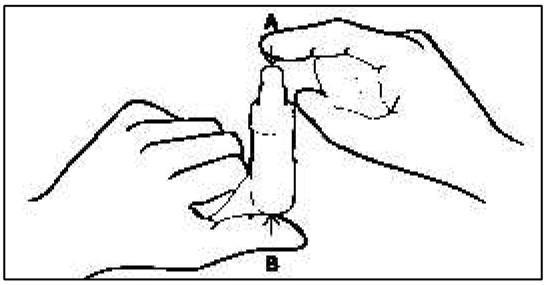
2. Check the contact surface on the cam and valve stem.
   If badly worn or damaged, replace it.
3. Check the hydraulic lash adjuster (HLA) face that contact the valve stem. If badly worn or damaged, replace the HLA.



ROCKER ARM SHAFT

1. Check the rocker arm shafts for damage. Replace as necessary.
2. Check the oil hole for any restriction.





Problem	Possible cause	Action
• Temporary noise on starting a cold engine	Normal	This noise will disappear after the oil in the engine has reached normal pressure.
• Continuous noise when engine is started after longer than 48 hours parking.	Oil drain out of the high pressure chamber on HLA, allowing air to get in.	Noise will disappear within 15 minutes of engine running at 2000~3000 rpm If not refer to item 7 below
• Continuous noise when engine is first started after rebuilding cylinder head.	Insuffecient oil in cylinder head oil gallery.	
• Continuous noise when engine is after excessive craking the engine by starter motor or band.	Oil drain out of the high-pressure chamber in HLA, allowing air to get in.	
• Continuous noise after changing HLA.		Do not run engine at a speed higher than 3000 rpm as this may damage HLA.

• Continuous noise during idle after high speed running.	Engine oil level too high or too low.	Check oil level. Drain or add oil as necessary.
	Execssive amount of air in the oil at high engine speed.	Check oil supply system
	Deteriorated oil	Check oil quality. If deteriorated, replace with specified type and amount of oil.
• Noise cotinues more than 15 minutes.	Low oil pressure	Check oil pressure and oil supply system of each part of engine.
	Faulty HLA.	Remove the cylinder head over and press down HLA by band. If it moves, replace HLA. CAUTION Be careful of hot HLA.

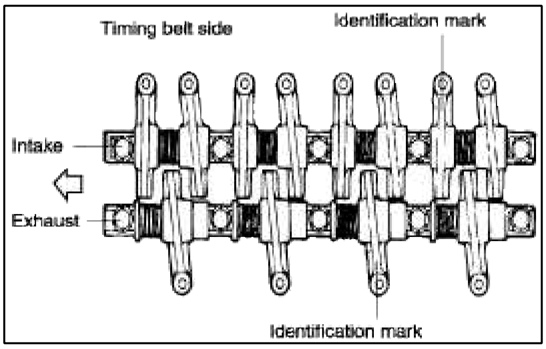
NOTE

HLA roise could occur to your engine due to malfunction of HLA if you use additives besides engine oil regulated to HMC.

REASSEMBLY

1. Install the rocker arms and rocker arm shaft springs to the rocker arm shafts, install the rocker arm shaft to the cylinder head.
   Tighten the rocker arm shaft mounting bolts to the specified torque.

   Tightening torque
   Rocker arm shaft mounting bolt :
   20 ~ 27 Nm (200 ~ 270 kg.cm, 15 ~ 20 lb.ft)



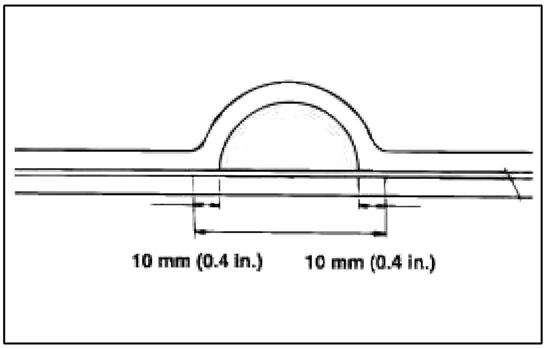
2. When installing the rocker arm, shaft and spring, mark the difference between left and right parts.
   Use the springs without distinction of intake and exhaust valve.
   Must set the parts that have smaller chamfers between rocker arm shafts.

3. Install the rocker cover and tighten the bolts to the specified torque.

Tightening torque
Rockr cover bolt :
8 ~ 10 Nm (80 ~ 100 kg.cm, 6 ~ 7 lb.ft)

CAUTION

1. Sealant must be applied to the top surface of cylinder head and cam caps. Area of application is shown in figure.
2. The proper amount of sealant must be used to prevent the sealant from squeezing out the sides..
3. Use sealant of specified brands or equivalant.
4. Sealant (Three bond No. 1212D aluminum color or equivalent).



4. Install the timing belt cover.

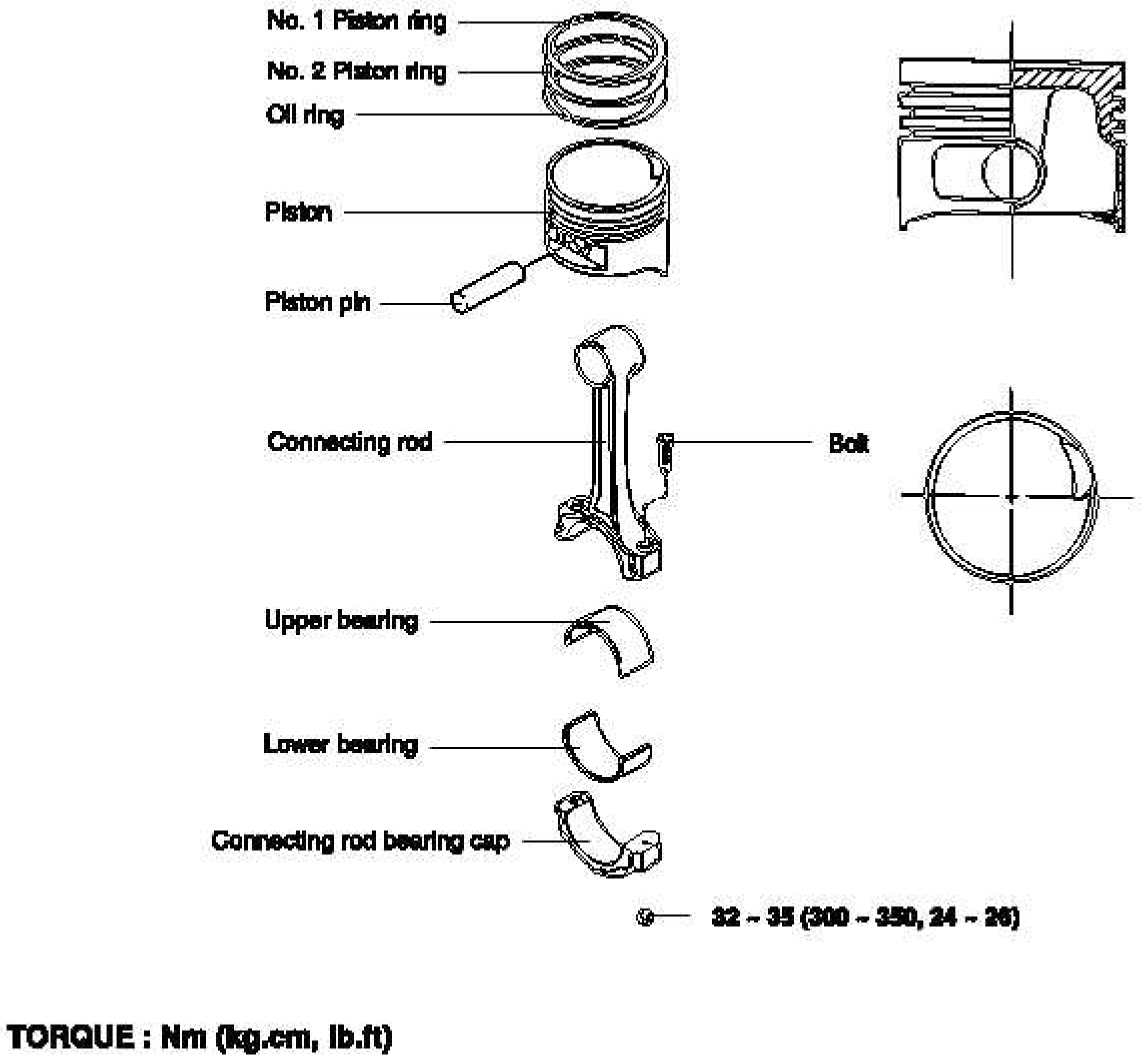
Tightening torque
Timing belt cover bolt :
10 ~ 12 Nm (100 ~ 120 kg.cm, 7 ~ 9 lb.ft)

---

5. Install the breather hose, PCV hose, blow by hose and spark plug cable.
6. Install the air intake hose and air duct.

Engine Mechanical System > Cylinder Block > Piston and Connecting Rod > Components and Components Location

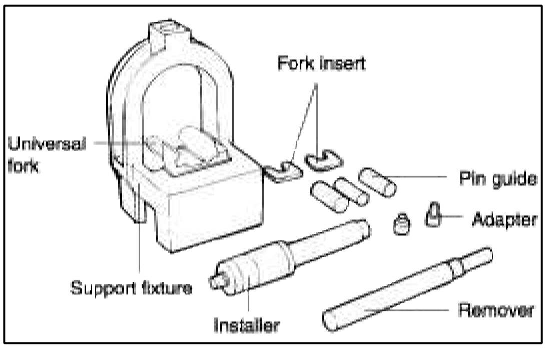
COMPONENTS


No. 1 Piston ring
No. 2 Piston ring
Oil ring
Piston
Piston pin
Connecting rod
Bolt
Upper bearing
Lower bearing
Connecting rod bearing cap
32 ~ 35 (300 ~ 350, 24 ~ 26)
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cylinder Block > Piston and Connecting Rod > Repair procedures

DISASSEMBLY

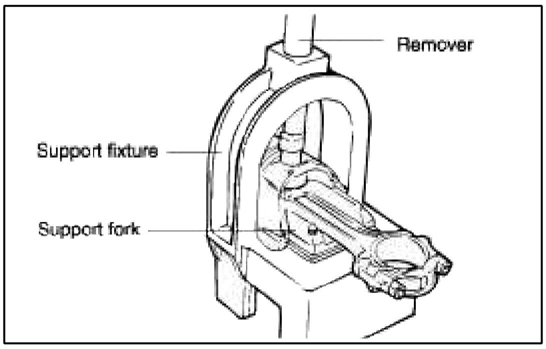
1. Use the Special Tools to disassemble and reassemble the piston and connecting rod.


Fork insert
Universal fork
Pin guide
Adapter
Support fixture
Installer
Remover

2. Place the proper fork inserts in the fork of the tool.
   Between the connecting rod and the piston.
3. Insert the proper removal tool through the hole in the arch of the tool.

> NOTE
>
> Center the piston, rod and pin assembly with the removal arbor.

4. Press the piston pin out of the connecting rod.



INSPECTION

PISTON AND PISTON PINS

1. Check each piston for scuffing, scoring wear, and other defects. Replace any piston that is defective.
2. Check each piston ring for breakage, damage and abnormal wear. Replace the defective rings. When the piston requires replacement, also replace the rings.
3. Check the piston pin fit in the piston pin hole. Replace any defective piston and pin assembly that is defective. The piston pin must be smoothly pressed by hand into the pin hole (at room temperature).

PISTON RINGS

1. Measure the piston ring side clearance. If the measured value exceeds the service limit, insert a new ring in a ring groove to measure the side clearance. If the clearance still exceeds the service limit, replace the piston and rings together. If it is less than the service limit, replace only the piston rings.

Piston ring side clearance
Standard value
No. 1 : 0.04 ~ 0.085 mm (0.0016 ~ 0.0033 in.)
No.2 : 0.04 ~ 0.085 mm (0.0016 ~ 0.0033 in.)
Limit
No. 1 : 0.1 mm (0.004 in.)
No. 2 : 0.1 mm (0.004 in.)

2. To measure the piston ring end gap, insert a piston ring into the cylinder bore. Position the ring at right angles to the cylinder wall by gently pressing it down with a piston Measure the gap with a feeler gauge. If the gap exceeds the service limit, replace the piston ring.

Item	Standard - mm (in.)	Limit - mm (in.)
Piston ring end gap No.1	0.20 ~ 0.35 (0.0079 ~ 0.0138)	1 (0.039)
Piston ring end gap No.2	0.37 ~ 0.52 (0.015 ~ 0.02)	1 (0.039)
Oil ring side rail end gap	0.20 ~ 0.70 (0.0078 ~ 0.0275)	1 (0.039)

When replacing the ring without correcting the cylinder bore, check the gap with the ring positioned at the bottom of the ring travel.
When replacing a ring, use a ring of the same size.

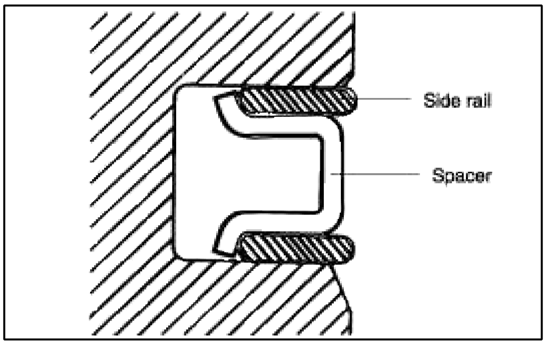
Piston ring service size and mark
STD : None
0.25 mm (0.010 in.) O.S. : 25
0.50 mm (0.020 in.) O.S. : 50

NOTE

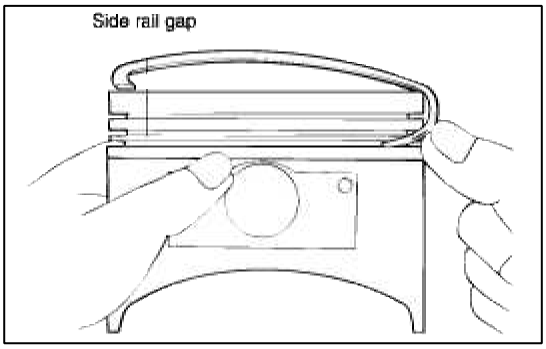
The mark can be found on the upper side of the ring.

REASSEMBLY

1. Install the spacer.



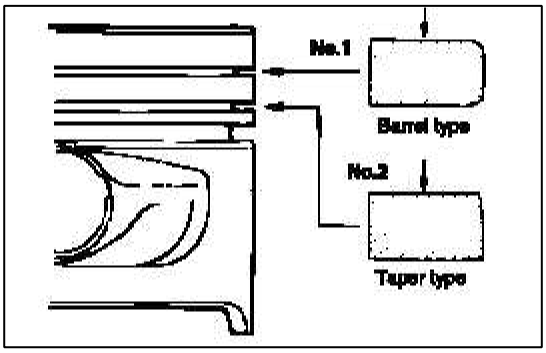
2. Install upper side rail. To install side rail, first put one end of side rail between piston ring groove and spacer, hold it down firmly, then press down the portion to be inserted with your finger into groove as illustrated.



NOTE

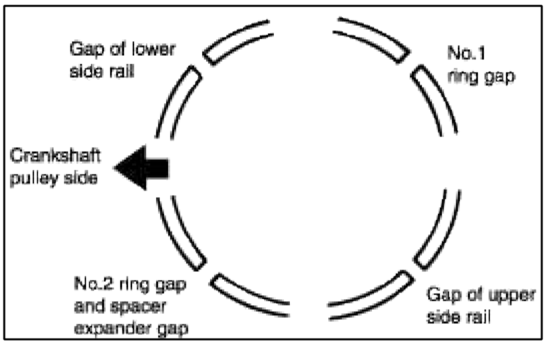
Do not use piston ring expander when installing side rail.

3. Install lower side rail using same procedure as Step 2.
4. Using piston ring expander, install No. 2 piston ring.
5. Install No. 1 piston ring.



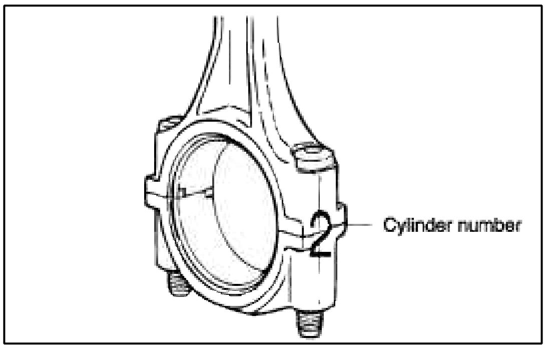
6. Apply engine oil around piston and piston rings.
7. Position each piston ring end gap as far apart from neighboring gaps as possible. Make sure that gaps are not positioned in side rail thrust and pin directions.

8. Hold piston rings firmly in a piston ring compressor as you insert them into cylinder.


Gap of lower side rail
No.1 ring gap
Crankshaft pulley side
No.2 ring gap and spacer expander gap
Gap of upper side rail

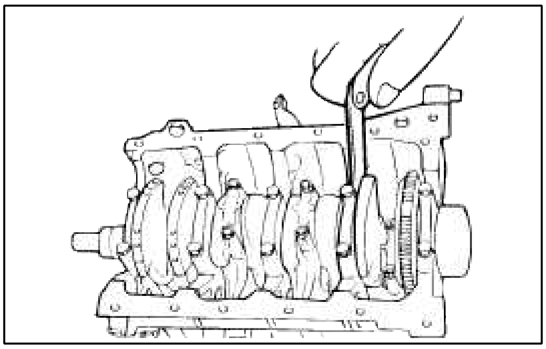
9. Make sure that the front mark of piston and the front mark (identification mark) of connecting rod are directed toward front of engine.
10. When connecting rod cap is installed, make sure that cylinder numbers put on rod and cap at disassembly match each other.
11. When new connecting rod is installed, make sure that notches for holding bearing in place are on same side.
12. Tighten the connecting rod cap nuts.

Tightening torque
Connecting rod cap nuts
32 ~ 35 Nm (320 ~ 350 kg.cm, 24 ~ 26 lb.ft)


2
Cylinder number

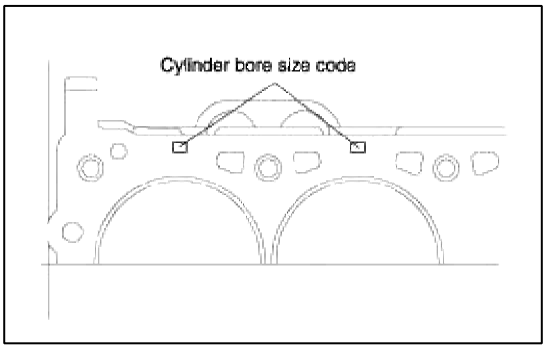
13. Check connecting rod side clearance.

Connecting rod side clearance
Standard value : 0.10 ~ 0.25 mm (0.004 ~ 0.0098 in.)
Limit : 0.4 mm (0.0157 in.)



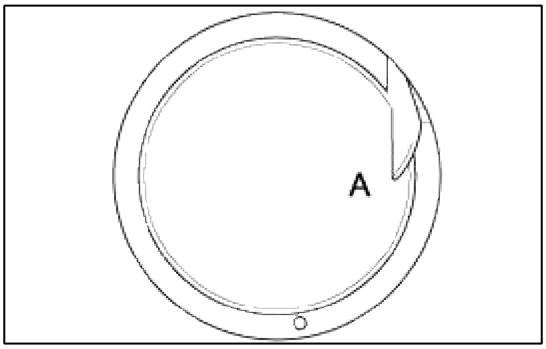
REPLACEMENT

1. Check the cylinder bore size code on the cylinder block top face.



Class	Cylinder bore inner diameter	Size code
A	75.5 ~ 75.51 mm (2.9724 ~ 2.9728 in.)	A
B	75.51 ~ 75.52 mm (2.9728 ~ 2.9732 in.)	None
C	75.52 ~ 75.53 mm (2.9732 ~ 2.9736 in.)	C

2. Check the piston size code on the piston top face.



Class	Piston outer diameter	Size code
A	75.47 ~ 75.48 mm (2.9712 ~ 2.9716 in.)	A
B	75.48 ~ 75.49 mm (2.9716 ~ 2.9720 in.)	None
C	75.49 ~ 75.50 mm (2.9720 ~ 2.9724 in.)	C

3. Selece the piston related to cylinder bore class.

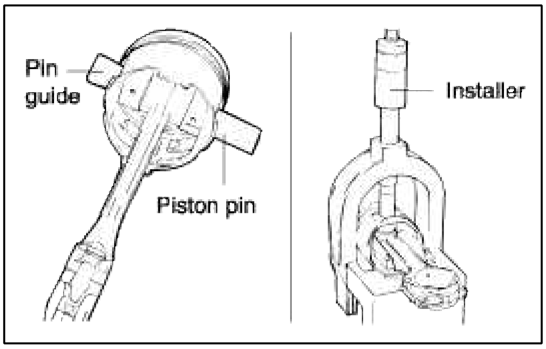
Oil clearance : 0.02 ~ 0.04 mm (0.00078 ~ 0.00157 in.)

INSTALLATION

1. Install proper pin guide through piston and into connecting rod. Hand tap pin guide into piston for proper retention. Drop piston pin into the other side of the piston.

NOTE

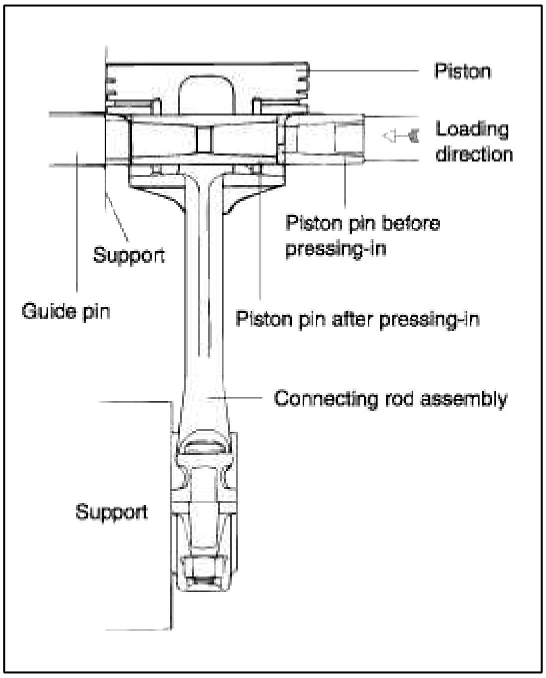
The pin guide centers the connecting rod in the piston. When the piston, connecting rod, piston pin and pin guide assembly are positioned on the fork of the tool, the pin guide will also center this assembly in the tool.If too small a pin guide is used, the piston assembly will not be located centrally in the tool, and damage may occur to the fork and/or insert of the tool.


Pin guide
Piston pin
Installer

2. Install piston assembly onto fork assembly of tool.
   Tool will support connecting rod at the piston pin. Be sure to slide the piston assembly into the fork until the pin guide contacts the fork insert.
3. Adjust the installing arbor to the proper length by turning the numbered sleeve on the lettered shaft until the specified alpha-numeric setting from the application chart is obtained. Turn knurled nut to lock numbered sleeve on shaft.
4. Insert the installing arbor through the hole in the arch of the tool. Press the piston pin into the connecting rod until the sleeve on the installing arbor contacts the top of the tool arch. The pin guide will fall out of the connecting rod as the piston pin is pressed in.

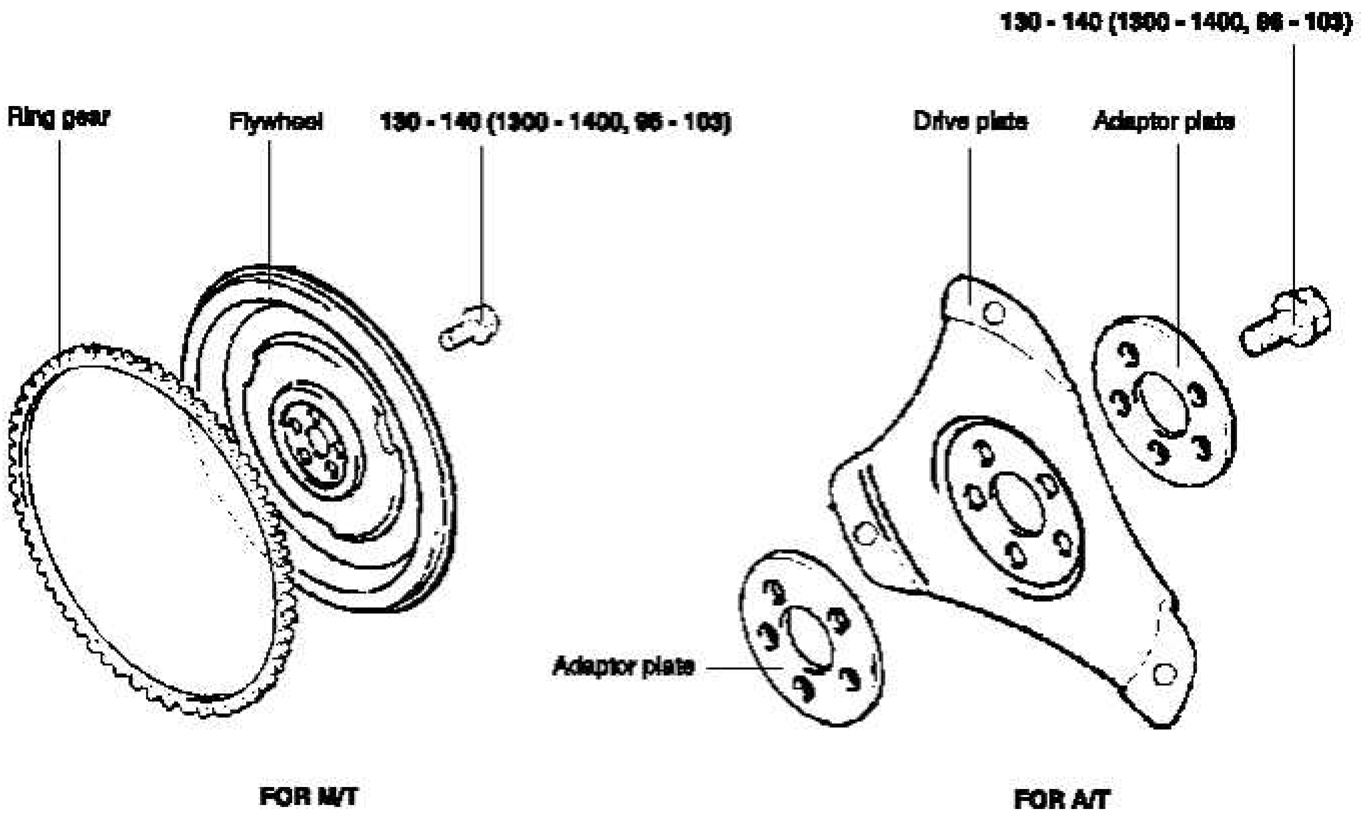
CAUTION

Do not exceed 5000 pounds of force when stopping the installing arbor sleeve against the arch.


Piston
Loading direction
Piston pin before pressing-in
Support
Guide pin
Piston pin after pressing-in
Connecting rod assembly
Support

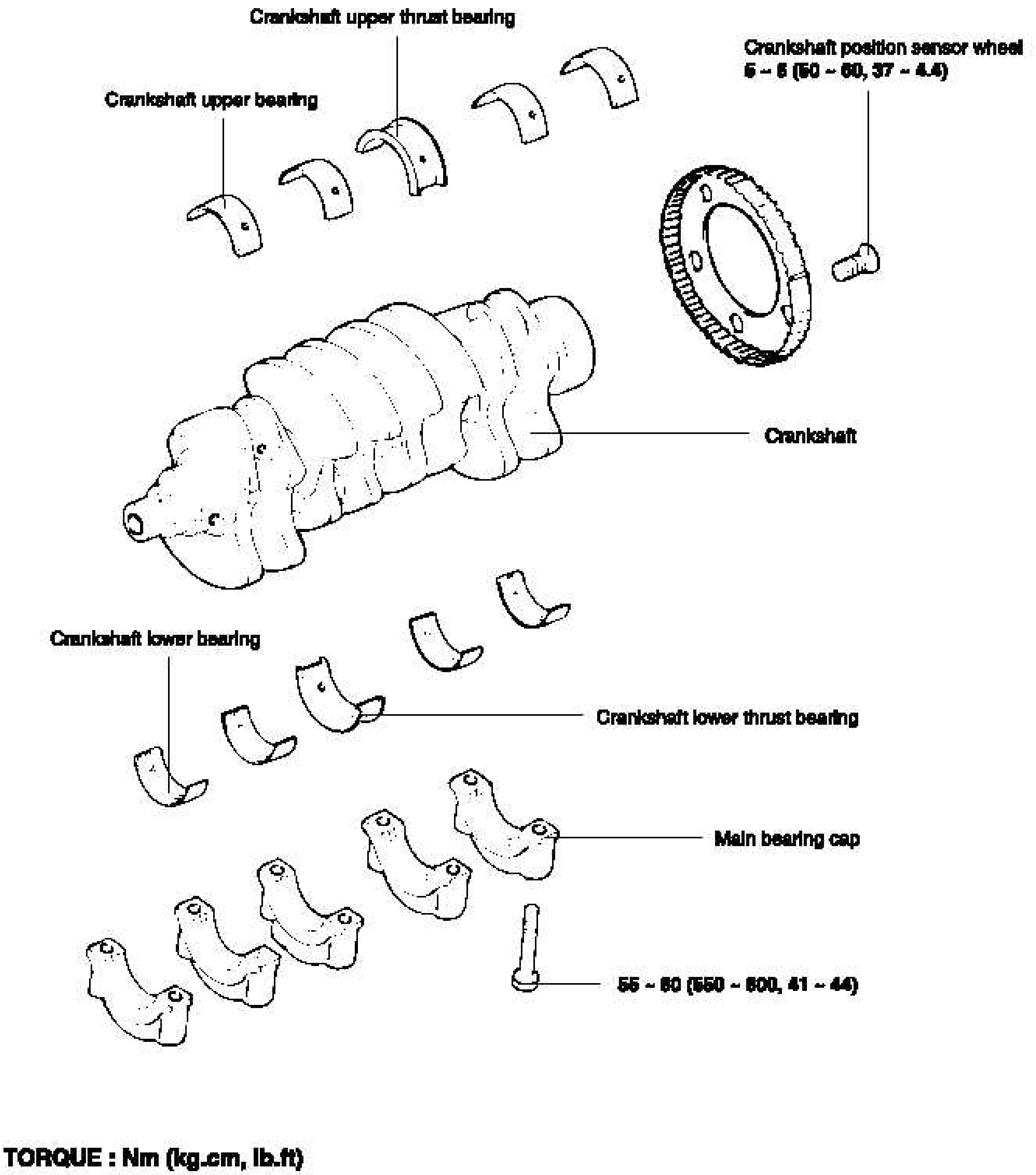
Engine Mechanical System > Cylinder Block > Crankshaft > Components and Components Location

COMPONENTS


130 - 140 (1300 - 1400, 96 - 103)
Ring gear
Flywheel
130 - 140 (1300 - 1400, 96 - 103)
Drive plate
Adaptor plate
Adaptor plate
FOR M/T
FOR A/T

TORQUE : Nm (kg.cm, lb.ft)

COMPONENTS


Crankshaft upper thrust bearing
Crankshaft position sensor wheel
5 ~ 6 (50 ~ 60, 37 ~ 4.4)
Crankshaft upper bearing
Crankshaft
Crankshaft lower bearing
Crankshaft lower thrust bearing
Main bearing cap
55 ~ 60 (550 ~ 600, 41 ~ 44)
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cylinder Block > Crankshaft > Repair procedures

DISASSEMBLY

1. Remove the transaxle and clutch.
2. Remove the flywheel.

DISASSEMBLY

1. Remove the timing belt train, front case, flywheel cylinder head assembly and oil pan. For details, refer to related chapters.
2. Remove the rear plate and the rear oil seal.

3. Remove the connecting rod caps.
4. Remove the main bearing caps and remove the crankshaft. Keep the bearings in order according to the cap number.
5. Remove the crankshaft position sensor wheel.

> **CAUTION**
>
> Mark the main bearing caps to permit reassembly in the original position and direction.

INSPECTION

1. Check the clutch disc contacting surface of the fly wheel for damage and wear. Replace the flywheel if excessively damaged or worn.
2. Check the clutch disc contacting surface of the fly wheel for runout.

Standard value
Flywheel run-out : 0.1 mm (0.004 in.)

3. Check the ring gear for damage, crack and wear, and replace if necessary.

INSPECTION

CRANKSHAFT

1. Check the crankshaft journals and pins for damage, uneven wear and cracks. Also check oil holes for clogging. Correct or replace any defective part.
2. Inspect out-of-roundness and taper of crankshaft journal and pin.

Standard value
Crankshaft journal O.D. : 50 mm (1.9685 in.)
Crankshaft pin O.D. : 45 mm (1.7717 in.)
Crankshaft journal, pin out-of-roundness and taper :
0.01 mm (0.0004 in.) or less

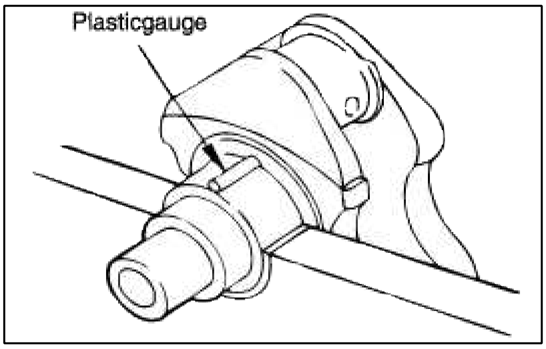
MAIN BEARINGS AND CONNECTING ROD BEARINGS
OIL CLEARANCE MEASUREMENT

Standard value
Journal oil clearance No. 1, 2, 4, 5 :
0.020 ~ 0.040 mm (0.0008 ~ 0.0016 in.)
Journal oil clearance No. 3 (center) :
0.028 ~ 0.046 mm (0.0011 ~ 0.0018 in.)
Pin oil clearance :
0.018 ~ 0.036 mm (0.0007 ~ 0.0014 in.)

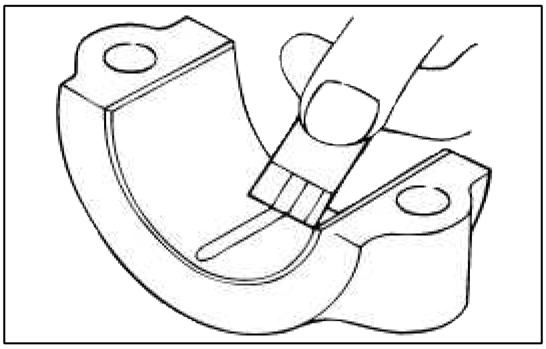
PLASTIC GAUGE METHOD

1. Remove oil, grease and any other dirt from bearings and journals.

2. Cut plastic gauge to the same length as the width of the bearing and place it parallel with the journal, away from the oil holes.



3. Install the crankshaft , bearings, and caps. Tighten them to the specified torque. During this operation, do not turn the crankshaft. Remove the caps.
   Measure the width of the plastic gauge at the widest point using the scale printed on the gauge package.
   If the clearance exceeds the repair limit, replace the bearing.
   Should the standard clearance not be obtained even after bearing replacement, the journal should be machined to a recommended undersize, and a bearing of the same size should be installed.



OIL SEAL

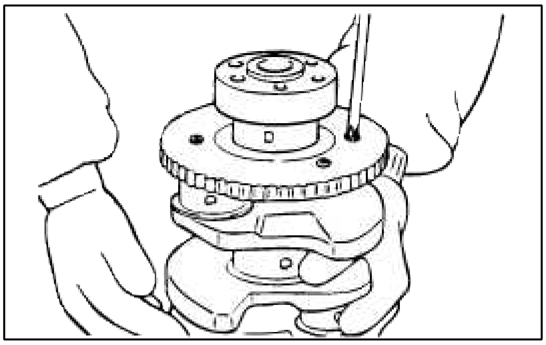
CRANKSHAFT POSITION SENSOR WHEEL

1. Remove the crankshaft position sensor wheel.
2. Check the crankshaft position sensor wheel for damage, cracks and wear. Replace if necessary.
3. Check the clearance between the crankshaft position sensor wheel and the crankshaft position sensor with a depth gage.

Standard value
Clearance between the crankshaft position sensor wheel and crankshaft position sensor :
0.5 ~ 1.5 mm (0.020 ~ 0.059 in.)

NOTE

1. Measure the depth of the top of the crankshaft position sensor wheel teeth and the outside of transaxle housing.
2. Measure the difference between the crankshaft position sensor length and depth.
3. The crankshaft position sensor length is the distance between the end of crankshaft position sensor and inner point of contacting face.



REASSEMBLY

Install the flywheel assembly and tighten the bolts to the specified forque.

Tightening torque
Flywheel bolt :
130 ~ 140 Nm (1300 ~ 1400 kg.cm, 96 ~ 103 lb.ft)

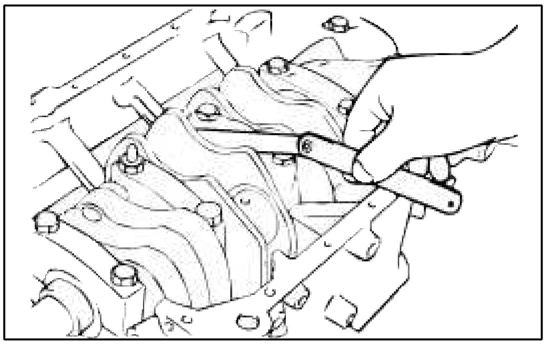
REASSEMBLY

1. Install the upper main bearing inserts in the cylinder block.
2. Install the crankshaft. Apply engine oil to the journals.
3. Install bearing caps and tighten cap bolts to the specified torque in the sequence of the center, No.2, 4, front and rear caps.
   Cap bolts should should be tightened evenly in 2 to 3 stages before they are tightened to the specified torque.
   The caps should be installed with the arrow mark directed toward the crank pulley side of engine. Cap numbers must be correct.

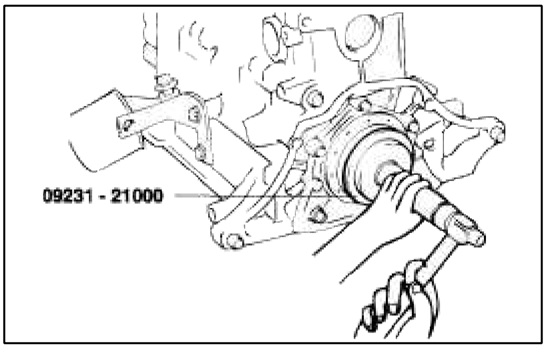
   Tightening torque
   Main bearing cap bolt :
   55 ~ 60 Nm (550 ~ 600 kg.cm, 41 ~ 44 lb.ft)
   Connecting rod cap bolt :
   32 ~ 35 Nm (320 ~ 350 kg.cm, 24 ~ 26 lb.ft)

4. Make certain that the crankshaft turns freely and has the proper clearance between the center main bearing thrust flange and the connecting rod big end bearing.

Standard value
Crankshaft end play :
0.05 ~ 0.175 mm (0.002 ~ 0.005 in.)



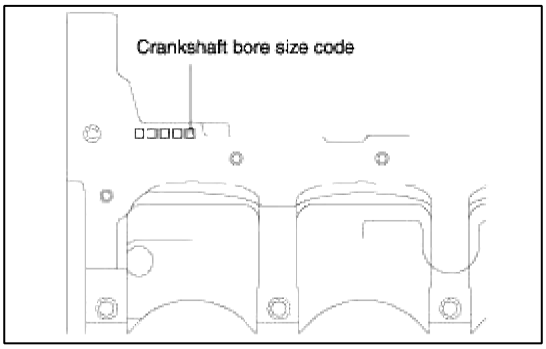
5. Install the oil seal in the crankshaft rear oil seal case.
   Use the special tool, crankshaft rear oil seal installer (09231 - 21000) as shown. Press and fit the oil seal in all the way, being careful not to misalign it.



6. Install the rear oil seal case and gasket. Tighten the five bolts.
   Apply engine oil to the oil seal lips and crankshaft at the time of installation.
7. Install the rear plate and tighten the bolts.
8. Install the connecting rod caps. Refer to the "Piston and Connecting Rods" section.
9. Install the flywheel, front case, oil pan and timing belt.
   For further details, refer to the respective chapters.

REPLACEMENT

1. Check the cylinder block stamping crankshaft bore size code.

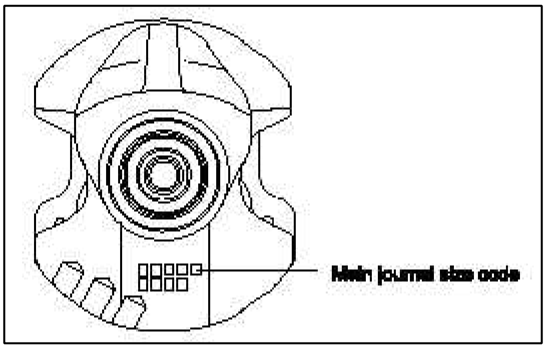


> **NOTE**
>
> Record the cylinder block crankshaft bore size code letters on cylinder block as shown.
> Reading order is from left to right with front crankshaft bore size code shown first.

Cylinder block crankshaft bore diameter

Class	Cylinder block crankshaft bore diameter	Size code.
a	54 ~ 54.006 mm (2.1259 ~ 2.1262 in.)	Λ
b	54.006 ~ 54.012 mm (2.1262 ~ 2.1264 in.)	b
c	54.012 ~ 54.016 mm (2.1264 ~ 2.1266 in.)	c

2. Check the crankshaft main journal



> **NOTE**
>
> Record the main journal size code letters on the crankshaft blance weight.
> Reading order is from left to right as shown, with no.1 main journal size code shown first.

CRANKSHAFT MAIN JOURNAL DIAMETER

Class	Main journal diameter	Size code.
I	49.968 ~ 49.962 mm (1.9672 ~ 1.9670 in.)	Λ
II	49.962 ~ 49.956 mm (1.9670 ~ 1.9667 in.)	b
III	49.956 ~ 49.950 mm (1.9667 ~ 1.9665 in.)	c

MAIN JOURNAL BEARING THICKNESS

No. 1, 2, 4, 5

Color	Main journal bearing thickness
Yellow	2.002~2.005mm (0.0788~0.0789in.)
Green	2.005~2.008mm (0.0789~0.0790in.)
No color	2.008~2.011mm (0.0790~0.0791in.)
Black	2.011~2.014mm (0.0791~0.0793in.)
Blue	2.014~2.017mm (0.0793~0.0794in.)

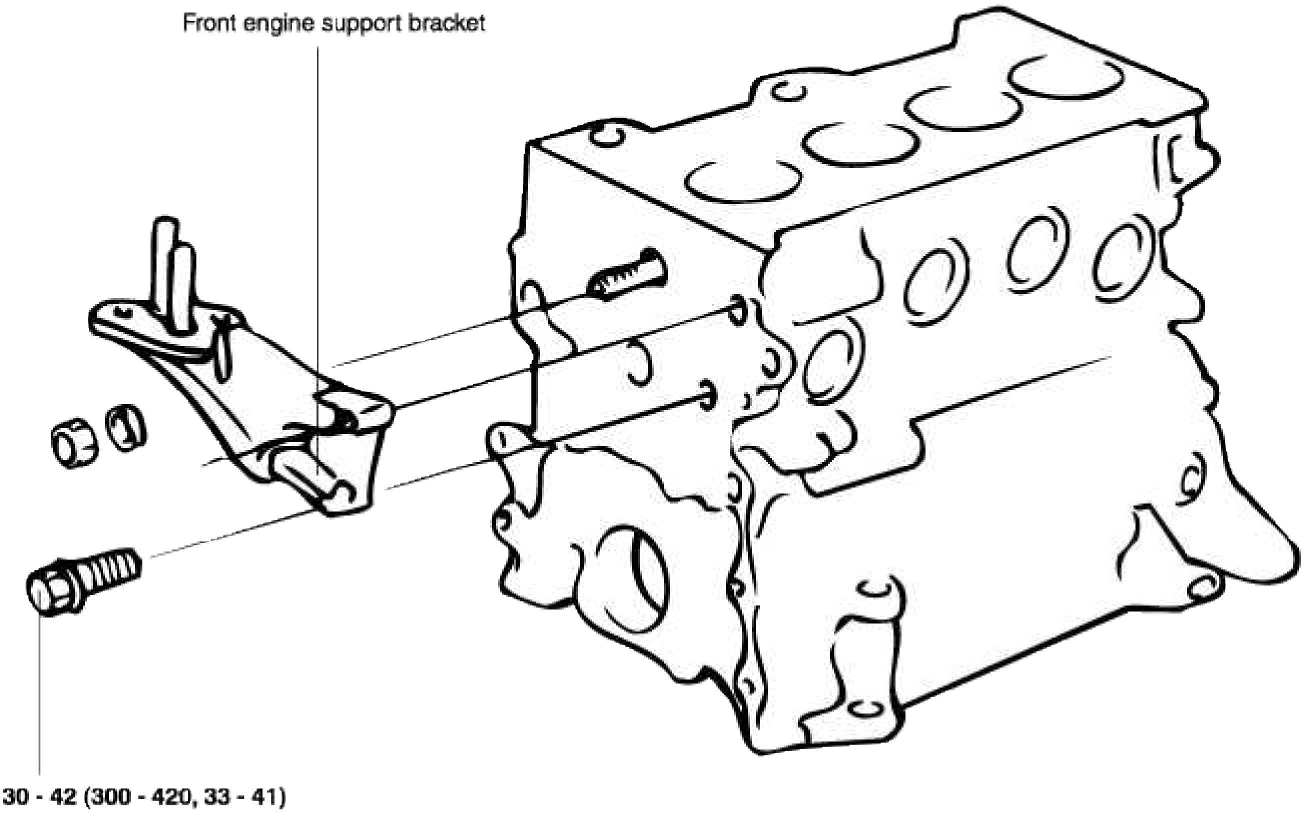
No.3 (Center bearing)

Color	Main journal bearing thickness
Yellow	1.999~2.002mm (0.0787~0.0788in.)
Green	2.002~2.005mm (0.0788~0.0789in.)
No color	2.005~2.008mm (0.0789~0.0790in.)
Black	2.008~2.011mm (0.0790~0.0791in.)
Blue	2.011~2.014mm (0.0791~0.0793in.)

3. Choose proper main journal bearing in table.

Engine Mechanical System > Cylinder Block > Cylinder Block > Components and Components Location

COMPONENTS


Front engine support bracket
30 - 42 (300 - 420, 33 - 41)

TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cylinder Block > Cylinder Block > Repair procedures

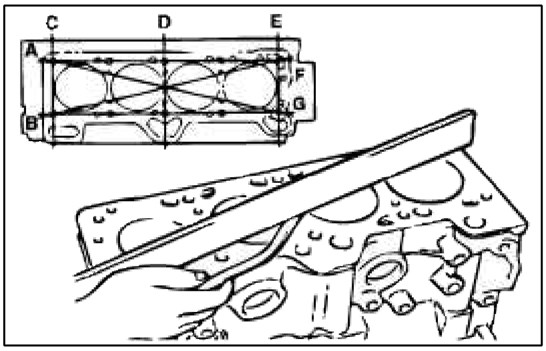
INSPECTION

CYLINDER BLOCK

1. Visually check the engine block for scores, rust and corrosion. Also check for cracks or any other defects. Repair or replace the block if defective.

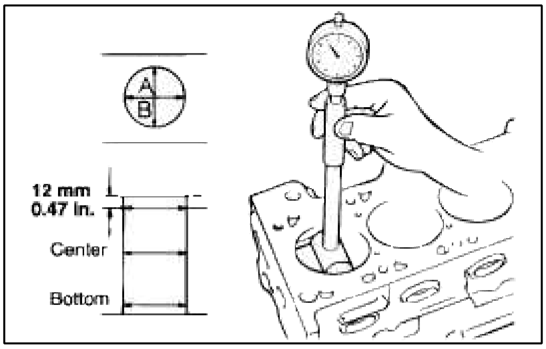
2. Using a straight edge and feeler gauge, check the block top surface for warpage. Make sure that the surface is free from gasket chips and other foreign matter.

Standard : 0.05 mm (0.0020 in.) or less
Limit : 0.1 mm (0.0039 in.)



3. Measure the cylinder bore with a cylinder gauge at three levels in the directions A and B. If the cylinder bores show more than the specified out-of-round-ness or taper or if the cylinder walls are badly scuffed or scored, the cylinder block should be rebored and honed. New oversize pistons and rings must be fitted. Measuring points are as shown.

Cylinder I.D. : 75.5 mm (2.9724 in.)
Cylinder I.D. taper : 0.02 mm (0.0008 in,.) or less



4. If a cylinder ridge exists, cut away with a ridge reamer.
5. Oversize pistons are available in four sizes

Piston service size and mark mm (in.)
0.25 (0.010) O.S. : 25
0.50 (0.020) O.S. : 50

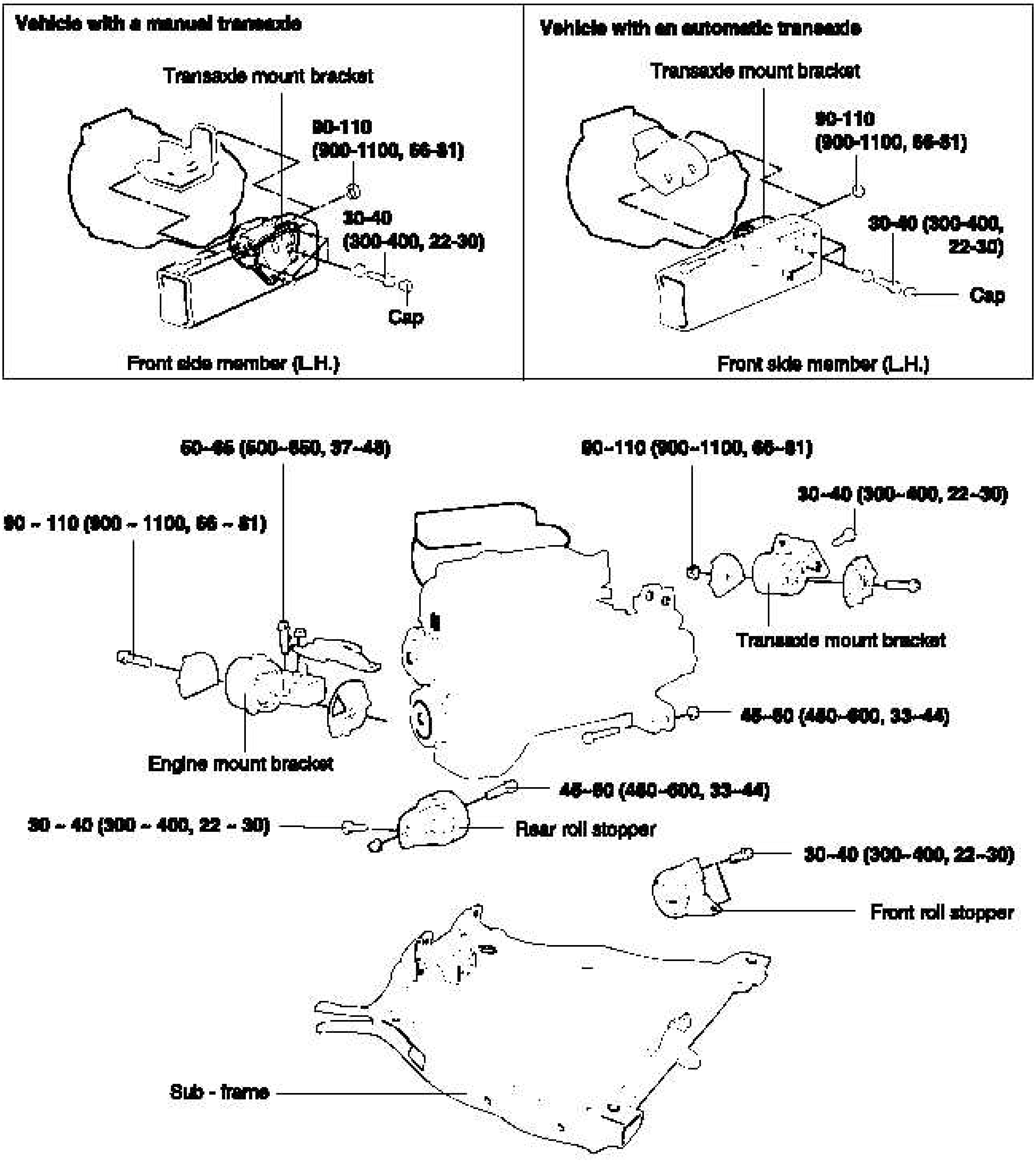
---

6. When boring the cylinder bore to oversize, keep the specified clearance between the oversize piston and the bore. Make sure that all pistons used are of the same oversize.

Piston - to - cylinder wall clearance :
0.02 ~ 0.04 mm (0.0008 ~ 0.0016 in.)

Engine Mechanical System > Cylinder Block > Engine Mounts > Components and Components Location

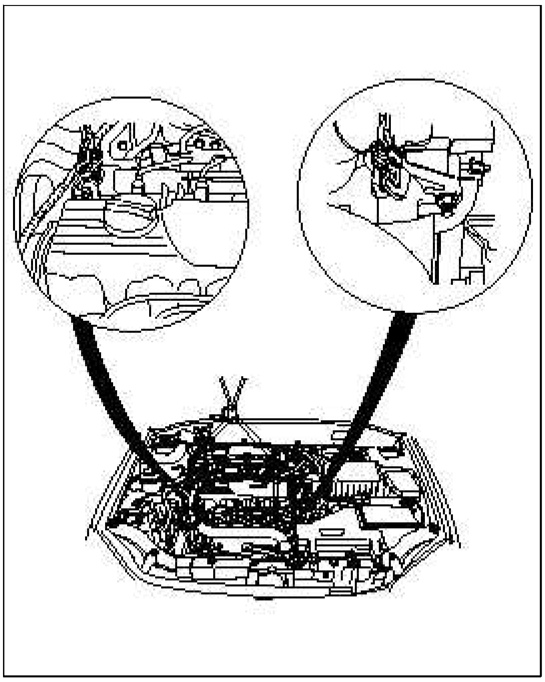
COMPONENTS


Vehicle with a manual transaxle
Transaxle mount bracket
90-110
(900-1100, 66-81)
30-40
(300-400, 22-30)
Cap
Front side member (L.H.)
Vehicle with an automatic transaxle
Transaxle mount bracket
90-110
(900-1100, 66-81)
30-40 (300-400,
22-30)
Cap
Front side member (L.H.)
50~65 (500~650, 37~48)
90~110 (900~1100, 66~81)
90 ~ 110 (900 ~ 1100, 66 ~ 81)
30~40 (300~400, 22~30)
Transaxle mount bracket
Engine mount bracket
45~60 (450~600, 33~44)
45~60 (450~600, 33~44)
30 ~ 40 (300 ~ 400, 22 ~ 30)
Rear roll stopper
30~40 (300~400, 22~30)
Front roll stopper
Sub - frame

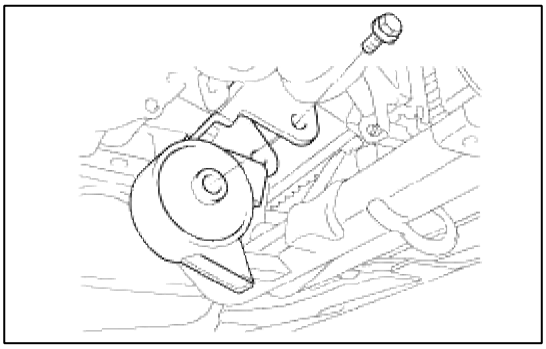
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cylinder Block > Engine Mounts > Repair procedures

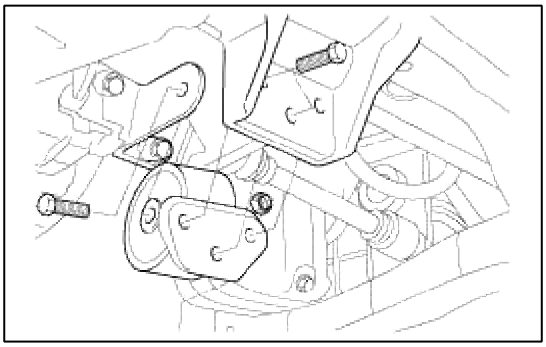
REMOVAL



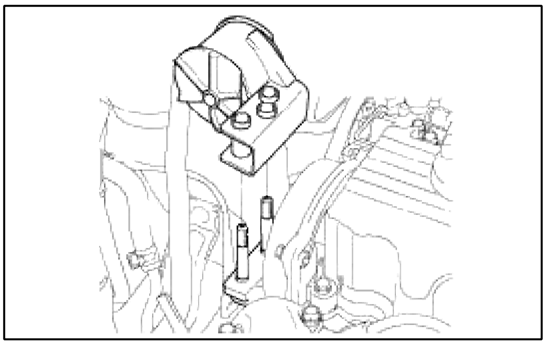
1. Remove the front roll stopper bracket from the sub-frame. (14 mm bolt and nut, 17 mm bolt.)



2. Remove the rear roll stopper bracket from the sub-frame.



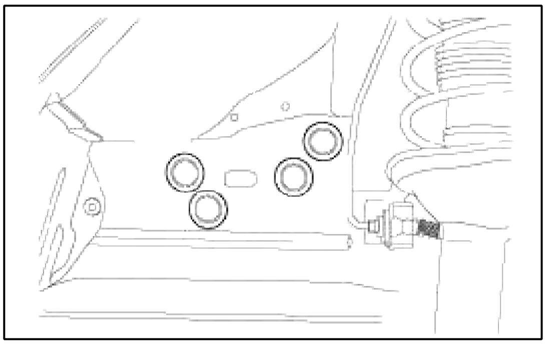
3. Engine
   (1) Remove the engine mount bracket from the engine. (14 mm, 17 mm)
   (2) Remove the engine mount insulator.



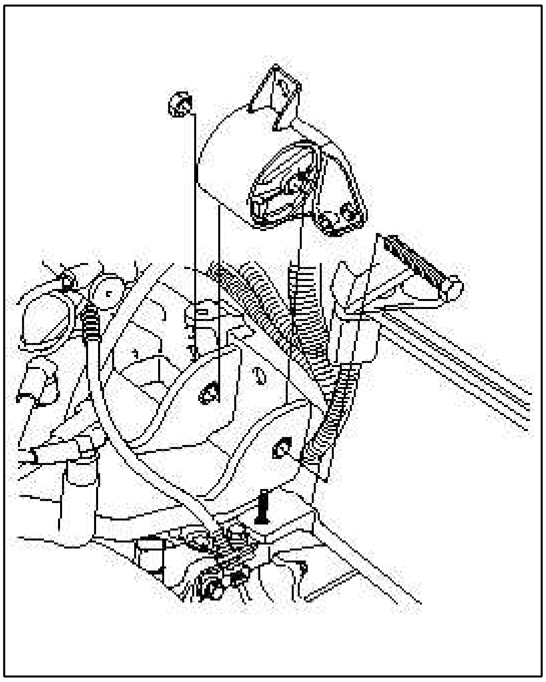
4. Transaxle

(1) Remove the transaxle mount bolt. (17 mm)

(2) Detach the cap from inside the right fender shield. Remove the transaxle mount bolts.

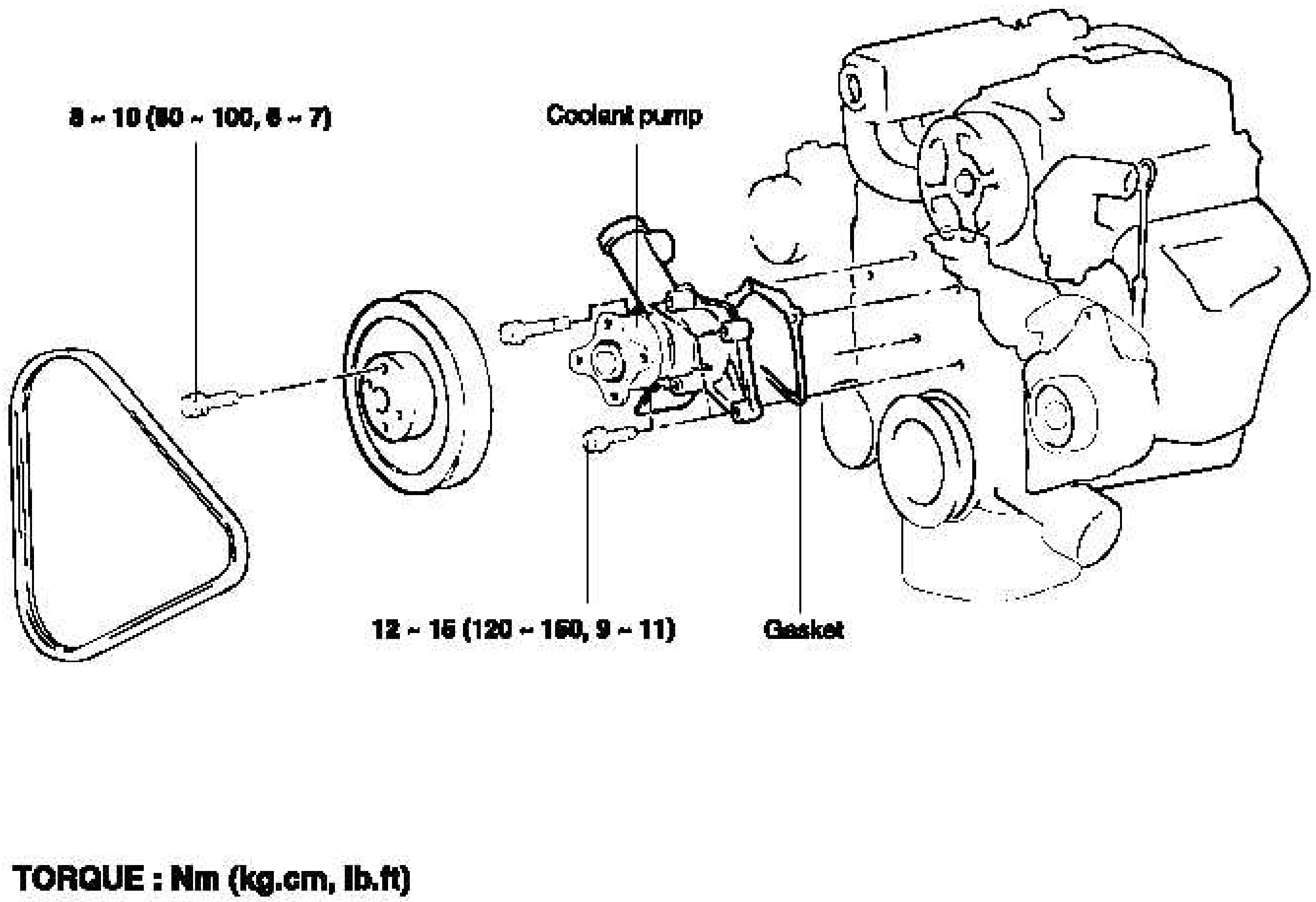


(3) Remove the transaxle mount bracket.



Engine Mechanical System > Cooling System > Water pump > Components and Components Location

COMPONENTS



Engine Mechanical System > Cooling System > Water pump > Repair procedures

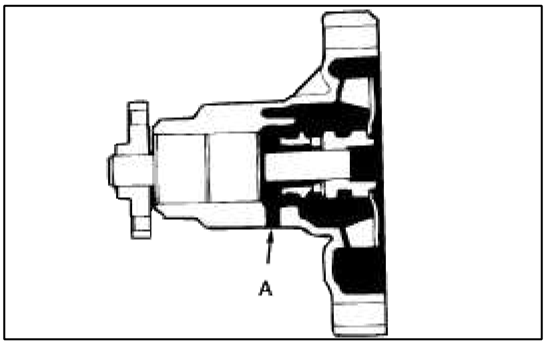
DISASSEMBLY

1. Drain the coolant and disconnect the coolant outlet pipe connection hose from the coolant pump.
2. Remove the drive belt and engine coolant pump pulley.
3. Remove the timing belt covers and the timing belt idler.
4. Remove the coolant pump mounting bolts, then remove the generator brace.
5. Remove the coolant pump assembly from the cylinder block.

INSPECTION

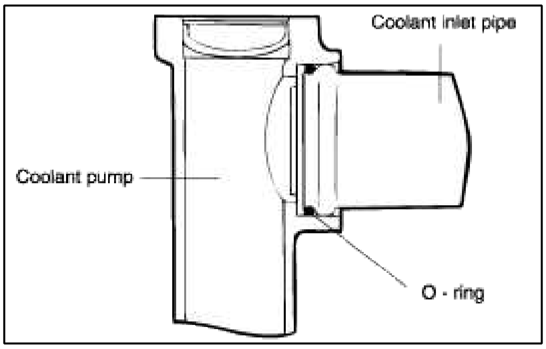
1. Check each part for cracks, damage or wear, and replace the coolant pump assembly if necessary.
2. Check the bearing for damage, abnormal noise and sluggish rotation. Replace the coolant pump assembly if necessary.

3. Check for coolant leakage. If coolant leaks form hole "A", the seal is defective. Replace the coolant pump assembly.



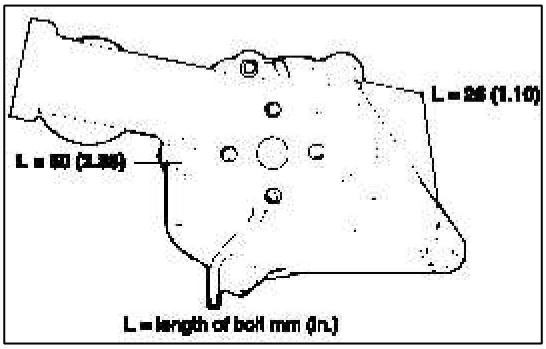
REASSDEMBLY

1. Clean the gasket surfaces of the coolant pump body and the cylinder block.



2. Install a new coolant pump gasket to the coolant pump and tighten the bolts to the specified torque.

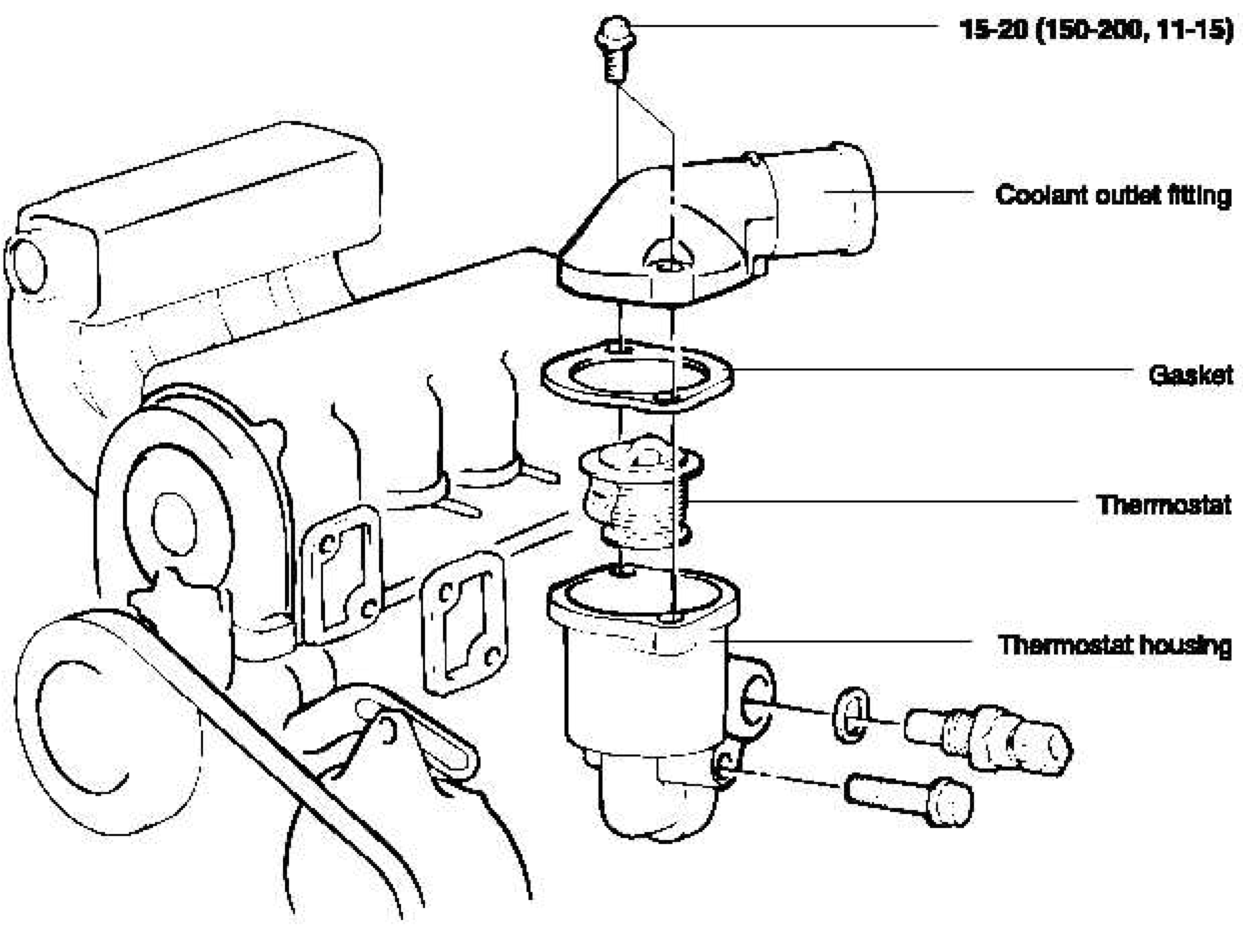
Tightening torque
Coolant pump bolt to cylinder block :
12 ~ 15 Nm (120 ~ 150 kg.cm, 9 ~ 11 lb.ft)



3. Install the timing belt idler and timing belt. Adjust the timing belt tension. Refer to the "Timing System" section.
4. Install the timing belt covers.
5. Install the coolant pump pulley, drive belt and adjust the belt tension.
6. Refill the system with clean coolant.
7. Run the engine and check for leaks.

Engine Mechanical System > Cooling System > Thermostat > Components and Components Location

COMPONENTS


15-20 (150-200, 11-15)
Coolant outlet fitting
Gasket
Thermostat
Thermostat housing

TORQUE : Nm (kg.cm, lb.ft)

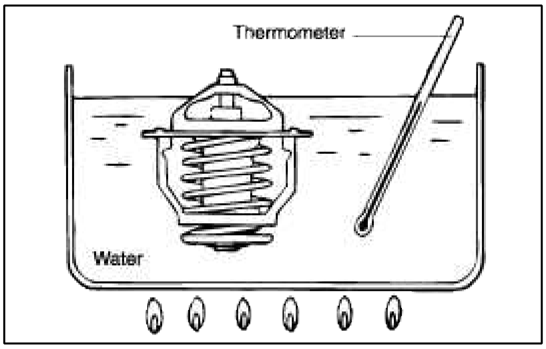
Engine Mechanical System > Cooling System > Thermostat > Repair procedures

INSPECTION

1. Drain the coolant down to thermostat level or below.
2. Remove the coolant outlet fitting and gasket.
3. Remove the thrmostat.

4. Immerse the thermostat in hot coolant to check proper valve opening temperature. Replace if necessary.

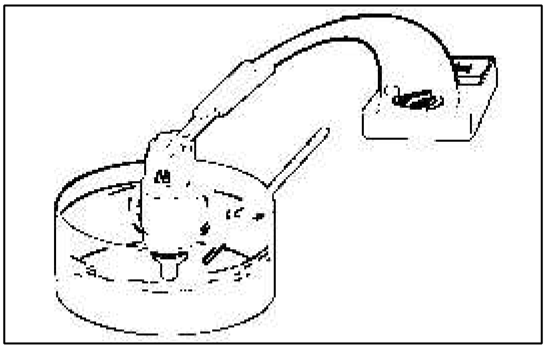
Valve opening temperature : 82° C (177° F)
Full opening temperature : 95° C (205 °F)
Valve lift (at full open) : 8.5 mm (0.33 in.) or more



COOLANT TEMPERATURE SENDER

1. Heat the engine coolant temperature sender by submerging it in hot water.
2. Check that the resistance is within the specified range.

Resistance : 123.8 ~ 172.8 Ω at 60°C (140°F)
23.5 ~ 29.5 Ω at 115°C (239°F)



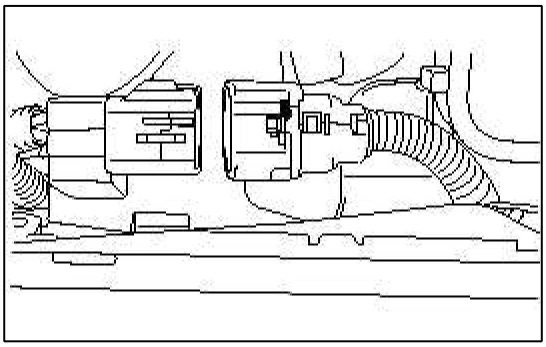
REASSEMBLY

1. Verify the flange of the thermostat is correctly seated in the socket of the thermostat housing. If the thermostat is installed in the wrong direction, the bottom of the thermostat will thuch the rib inside the intake manifold, making it impossible for the thermostat to operate properly.
2. Install a new gasket and the coolant outlet fitting.
3. Refill the system with clean coolant.

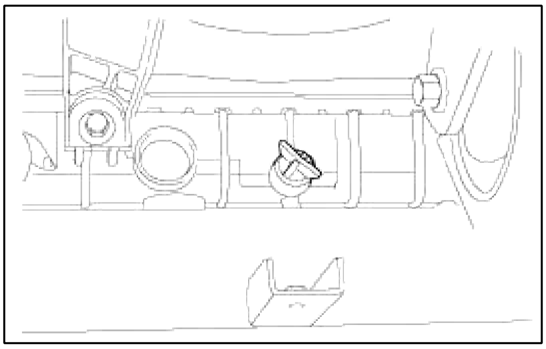
Engine Mechanical System > Cooling System > Radiator > Repair procedures

DISASSEMBLY

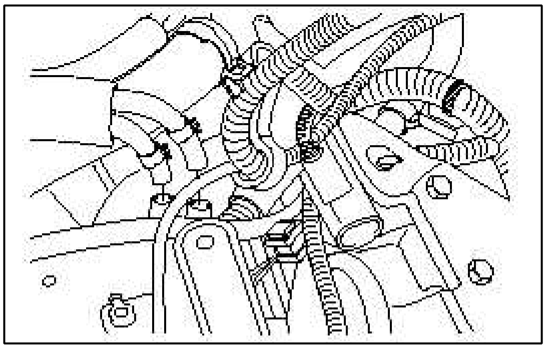
1. Disconnect the radiator fan motor connector.



2. Set the temperature of the heater control to the hot position.
3. Loosen the radiator drain plug to drain coolant.

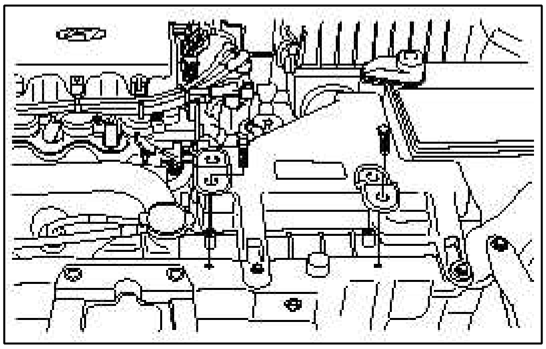


4. Disconnect the upper and lower hose and overflow tube.
5. For vehicles with automatic transaxles, disconnect the oil cooler hoses from the automatic transaxle.



> **CAUTION**
>
> Plug the ends of the oil cooler hoses and the automatic transaxle fittings to prevent transaxle fluid form spilling out and foreign material from entering.

6. Remove the radiator mounting bolts.



7. Remove the radiator together with the fan motor.
8. Remove the fan motor from the radiator.

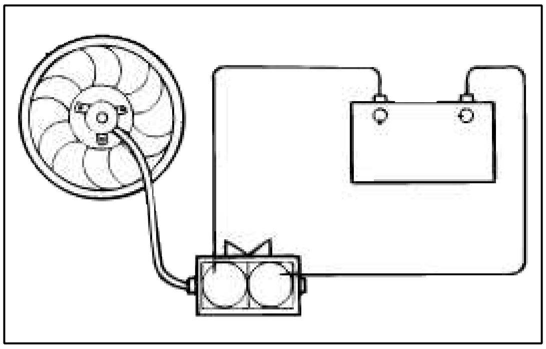
INSPECTION

1. Check the radiator for bent, broken or plugged fins.

2. Check the radiator for corrosion, damage, rust or scale.
3. Check the radiator hoses for cracks, damage or deterioration.
4. Check the reservoir tank for damage.
5. Check the radiator cap spring for damage.
6. Test the pressure of the cap using a cooling system checker
7. Check the radiator cap seal for cracks or damage.

RADIATOR FAN MOTOR

1. Check that the radiator fan rotates when battery voltage is applied to the terminals (as shown in figure).



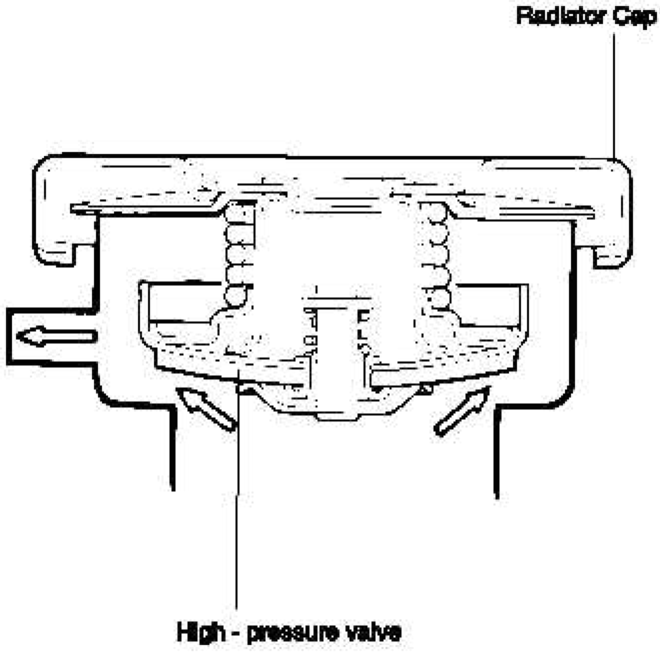
2. Check that abnormal noises are not produced while the motor is turning.

REASSEMBLY

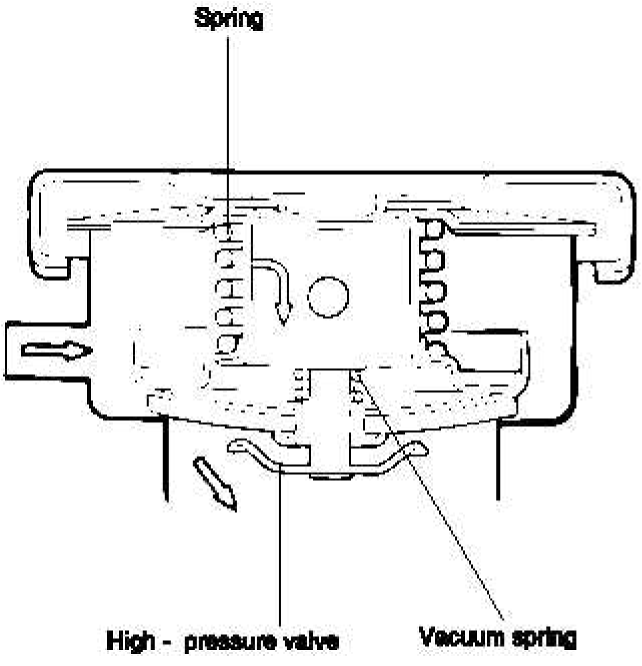
1. Fill the radiator and reservoir tank with clean coolant mixture.
2. Run the engine until the thermostat opens, and then stop the engine.
3. Remove the radiator cap, and add coolant up to the filler neck of the radiator, and then fill the reservoir tank to the upper level.
4. Check that there is no leakage from the radiator, hoses or connections.

Engine Mechanical System > Cooling System > Radiator Cap > Components and Components Location

COMPONENTS


Radiator Cap
High - pressure valve

When the pressure is peduced to the specified level
[81.4 - 108 Kpa (0.83 - 1.1 kg/cm, 11.8 - 15.6 psi)]

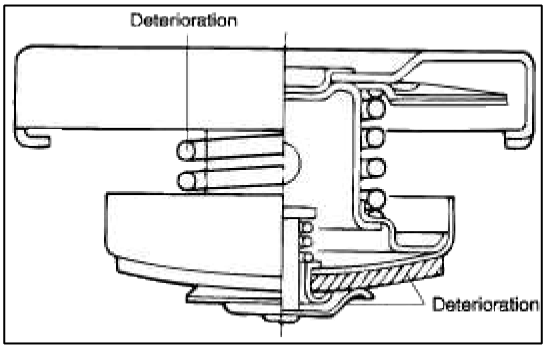

Spring
High - pressure valve
Vacuum spring

When the pressure is peduced to the specified level
[-6.86 Kpa (- 0.07 kg/cm, -1.00 psi)]

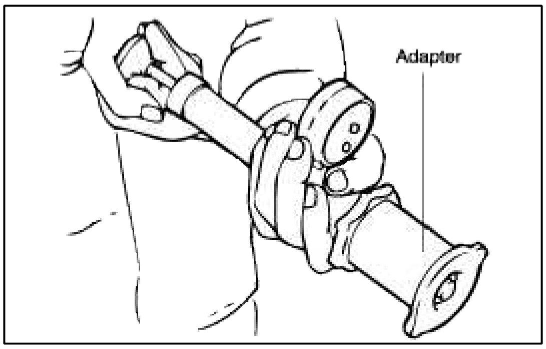
Engine Mechanical System > Cooling System > Radiator Cap > Repair procedures

INSPECTION

1. Check the radiator cap for damage, cracks and deterioration.

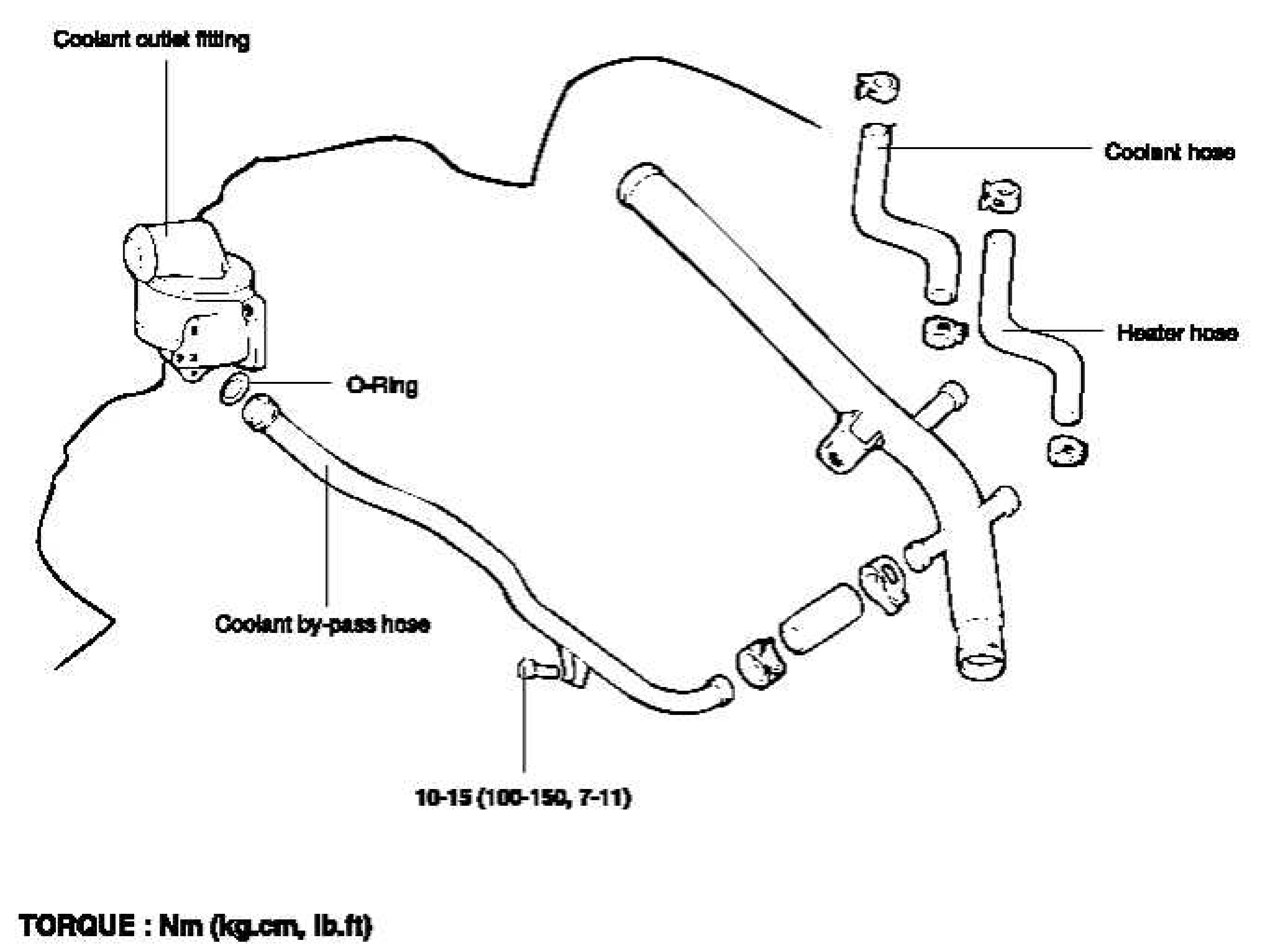

Deterioration
Deterioration

2. Attach a radiator cap tester to the radiator.
3. Pump the tester until the pointer stabilizes.
4. If the pointer stays constant for 10 seconds at a pioint exceeding the service limit, the radiator cap is good.



Engine Mechanical System > Cooling System > Engine Coolant Hose / Pipes > Components and Components Location

COMPONENTS


Coolant outlet fitting
Coolant hose
Heater hose
O-Ring
Coolant by-pass hose
10-15 (100-150, 7-11)
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Cooling System > Engine Coolant Hose / Pipes > Repair procedures

INSPECTION

1. Check the coolant pipes and hoses for cracks, damage, or restrictions.
2. Replace if necessary.

REASSEMBLY

1. Fit the O - ring in the groove provided at the coolant inlet pipe end, wet the O-ring with coolant and insert into the coolant inlet pipe.

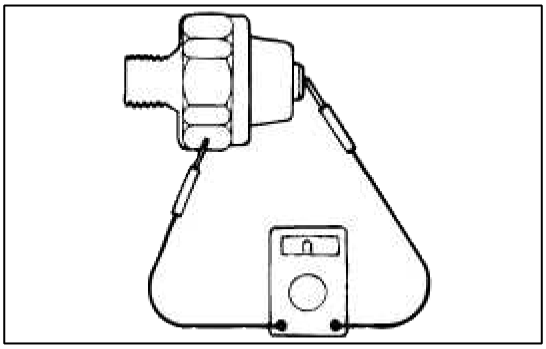
2. Make sure that there is a yellow mark on the inlet coolant hose and while keeping the yellow mark toward of the coolant inlet pipe, fit the hose to the pipe to the end of the yellow mark.

> **NOTE**
>
> 1. Do not apply oil or grease to the coolant pipe O-ring
> 2. Keep the coolant pipe connections free of sand, dust, etc.
> 3. Insert the coolant pipe fully into the coolant pump.
> 4. Do not reuse the O-ring, replace it with a new one.

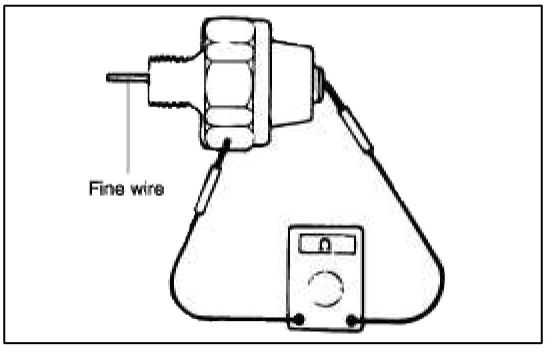
Engine Mechanical System > Lubrication System > Oil Pump > Description and Operation

OIL PRESSURE SWITCH

1. Check the continuity between the terminal and the body with an ohmmeter.

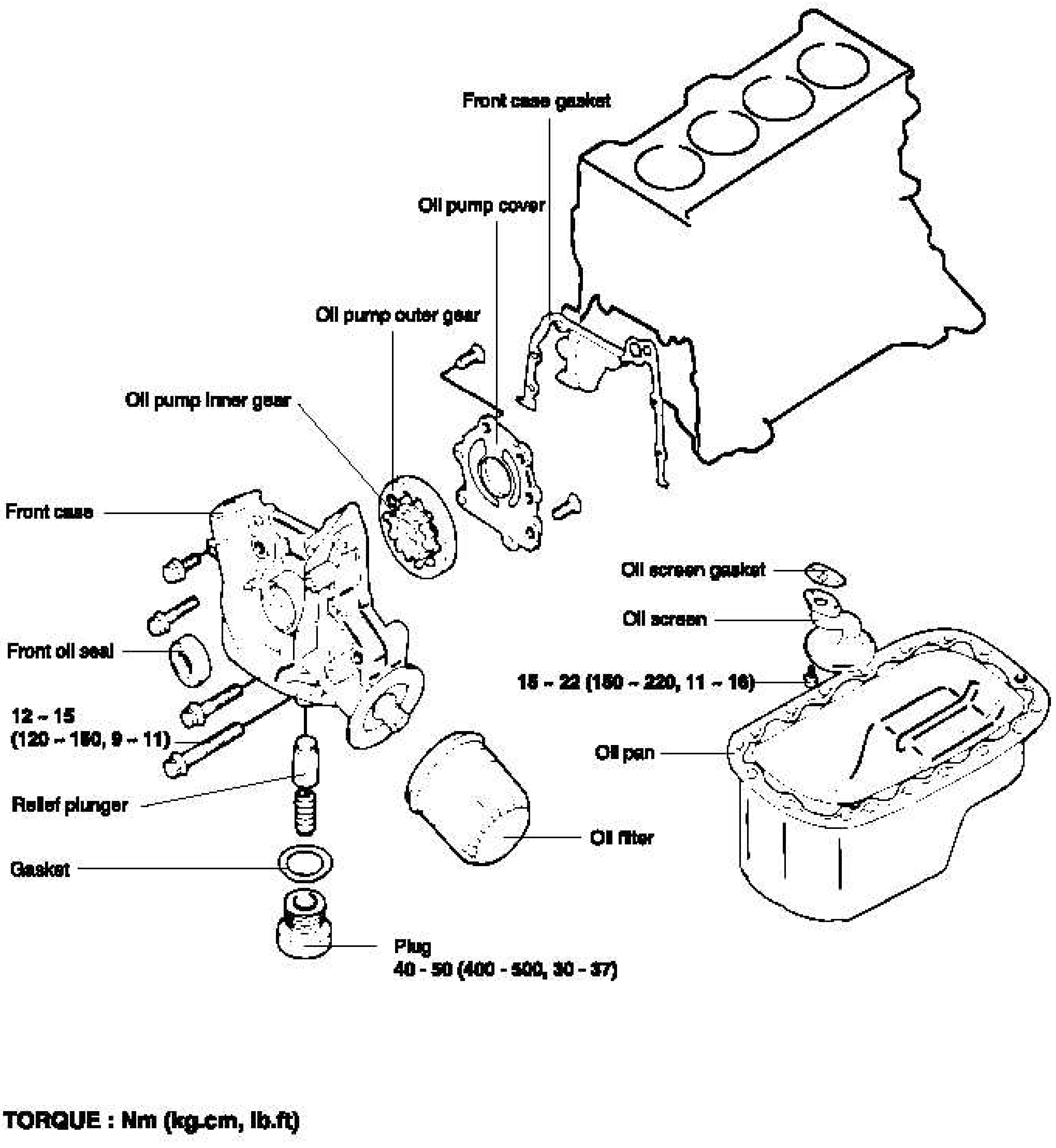


2. Check the continuity between the terminal and the body when the fine wedge is pushed. If there is continuity enve when the fine wedgew is pushed, replace it.
3. However, if there is non continuity when a 50 Kpa (70 psi) vacuum is applied through the oil hole, the switch is operating properly. Check to see that air doesn't leak. If air leaks, the diaphragm is broken. Replace the switch.



Engine Mechanical System > Lubrication System > Oil Pump > Components and Components Location

COMPONENTS

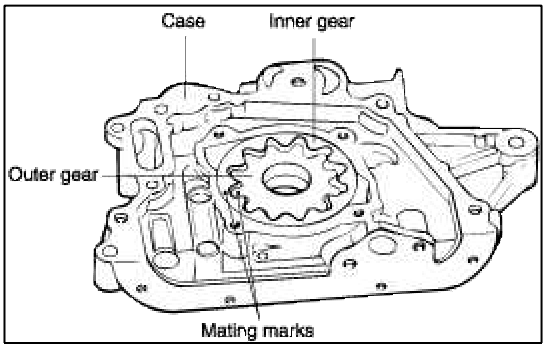

Front case gasket
Oil pump cover
Oil pump outer gear
Oil pump inner gear
Front case
Oil screen gasket
Oil screen
Front oil seal
15 ~ 22 (150 ~ 220, 11 ~ 16)
12 ~ 15
(120 ~ 150, 9 ~ 11)
Oil pan
Relief plunger
Oil filter
Gasket
Plug
40 - 50 (400 - 500, 30 - 37)
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Lubrication System > Oil Pump > Repair procedures

DISASSEMBLY

1. Remove the timing belt. Refer to the "Timing Belt" section.
2. Remove all the oil pan bolts.
3. Remove the oil pan.
4. Remove the oil screen.
5. Remove the front case assembly.
6. Remove the oil pump cover.

7. Remove the inner and outer gears from the front case. The mating marks on the inner and outer gears indicate the direction of installation. Make sure that the inner and outer gears are installed as shown.



8. Remove the plug and remove the relief spring and relief plunger.

INSPECTION

OIL PAN AND OIL SCREEN

1. Check the oil pan for failure, damage or cracks. Replace of defective.
2. Check the oil screen for failure, damage and cracks and replace of defective.

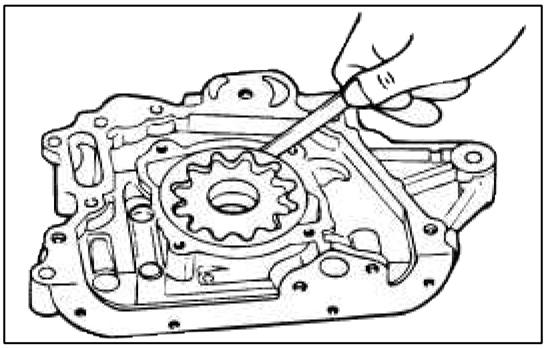
FRONT CASE AND OIL PUMP COVER

Check for worn (especially stepped) or damaged surfaces contacting gears.

OIL PUMP GEARS

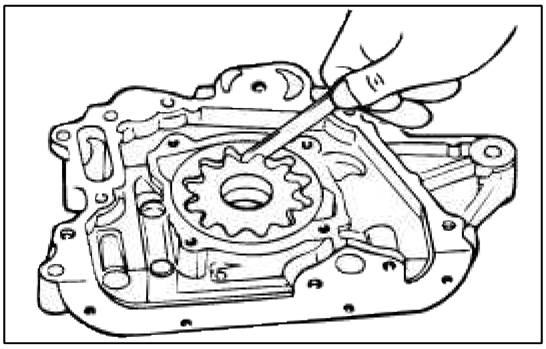
1. Check for worn or damaged gear teeth surfaces.
2. Check for clearance between outer gear and front case.

Outer gear
Clearance between outer circumference and front case :
0.12 ~ 0.18 mm (0.005 ~ 0.007 in.)



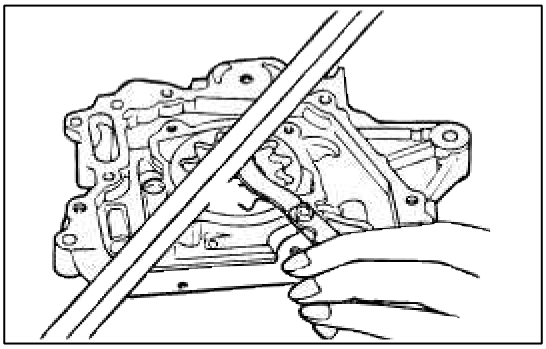
3. Check the tip clearance on the pump rotor.

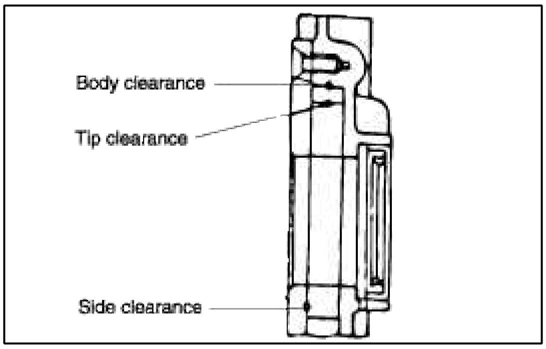
Standard value :
0.025 ~ 0.069 mm (0.001 ~ 0.003 in.)



4. Check the axial clearance on the outer pump roter.

Standard value :
0.04 ~ 0.087 mm (0.0016 ~ 0.0034 in.)

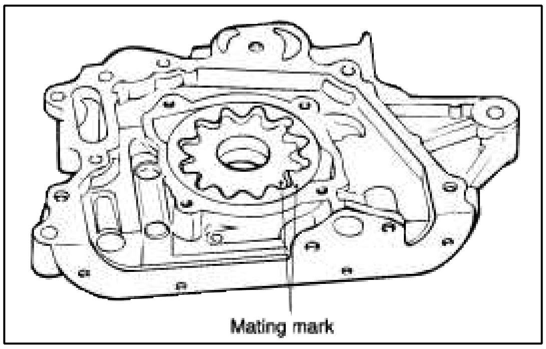




REASSEMBLY

OIL PUMP

1. Install the outer and inner gears into the front case.
   Make sure that the inner and outer gears are installed in the same direction as shown.



2. Install the oil pump cover and tighten the bolts to the specified torque. Atfer the bolts have been tithtened, check to ensure that the gear turns smoothly.

Tightening torque
Oil pump cover bolt :
8 ~ 12 Nm (80 ~ 120 kg.cm, 6 ~ 8.8 lb.ft)

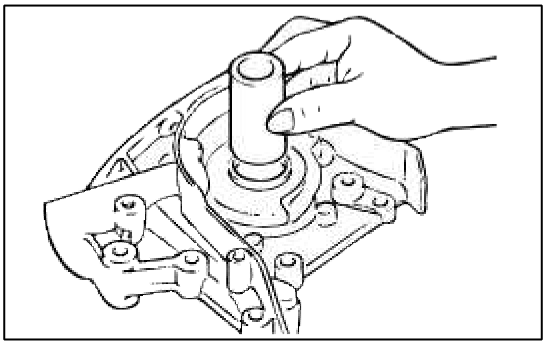
---

3. Install the relief valve and spring. Tighten the plug to the specified torque. Apply engine oil to the relief valve.

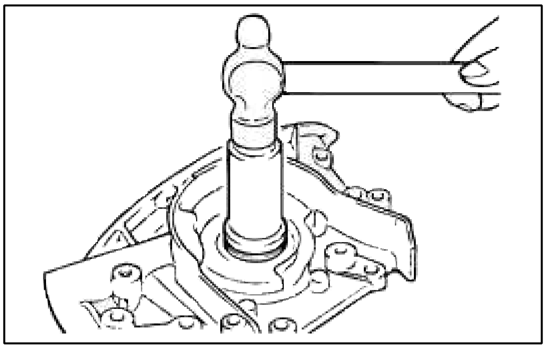
Tightening torque
Relief valve plug :
40 ~ 50 Nm (400 ~ 500 kg.cm, 30 ~ 37 lb.ft)

OIL SEAL

1. Inspect for worn, distorted or damaged lips.
2. Check for elongated spring ring.
3. Install the Special Tool, Crankshaft Front Oil Seal Guide (09231 - 22100), to the front end of the crankshaft. Apply engine oil to the outer surface of the oil seal guide, and install the new oil seal along the guide by hand, until it touches front case. Always use a new oil seal when reassembling.



4. Use the Special Tool, Crankshaft Front Oil Seal Installer (09231 - 22000), to install the oil seal.

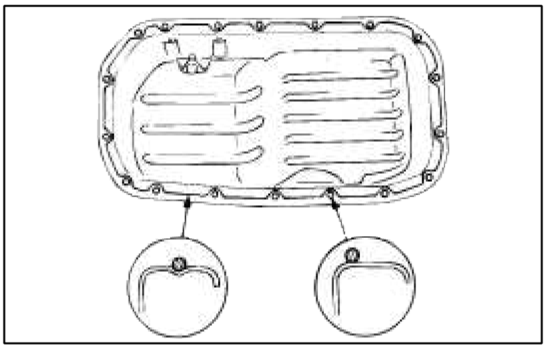


5. Install the crankshaft sprocket, timing belt and crankshaft pulley. Refer to the "Timing Belt" section.
6. Install the oil screen.
7. Clean both gasket surfaces of the oil pan and the cylinder bolck.
8. Apply sealant into the groove of the oil pan flange as shown.

> **CAUTION**
>
> 1. Apply sealant approx. 4 mm (0.16 in.) in thickness.
> 2. After application of sealant, do not exceed 15 minutes before installing the oil pan.

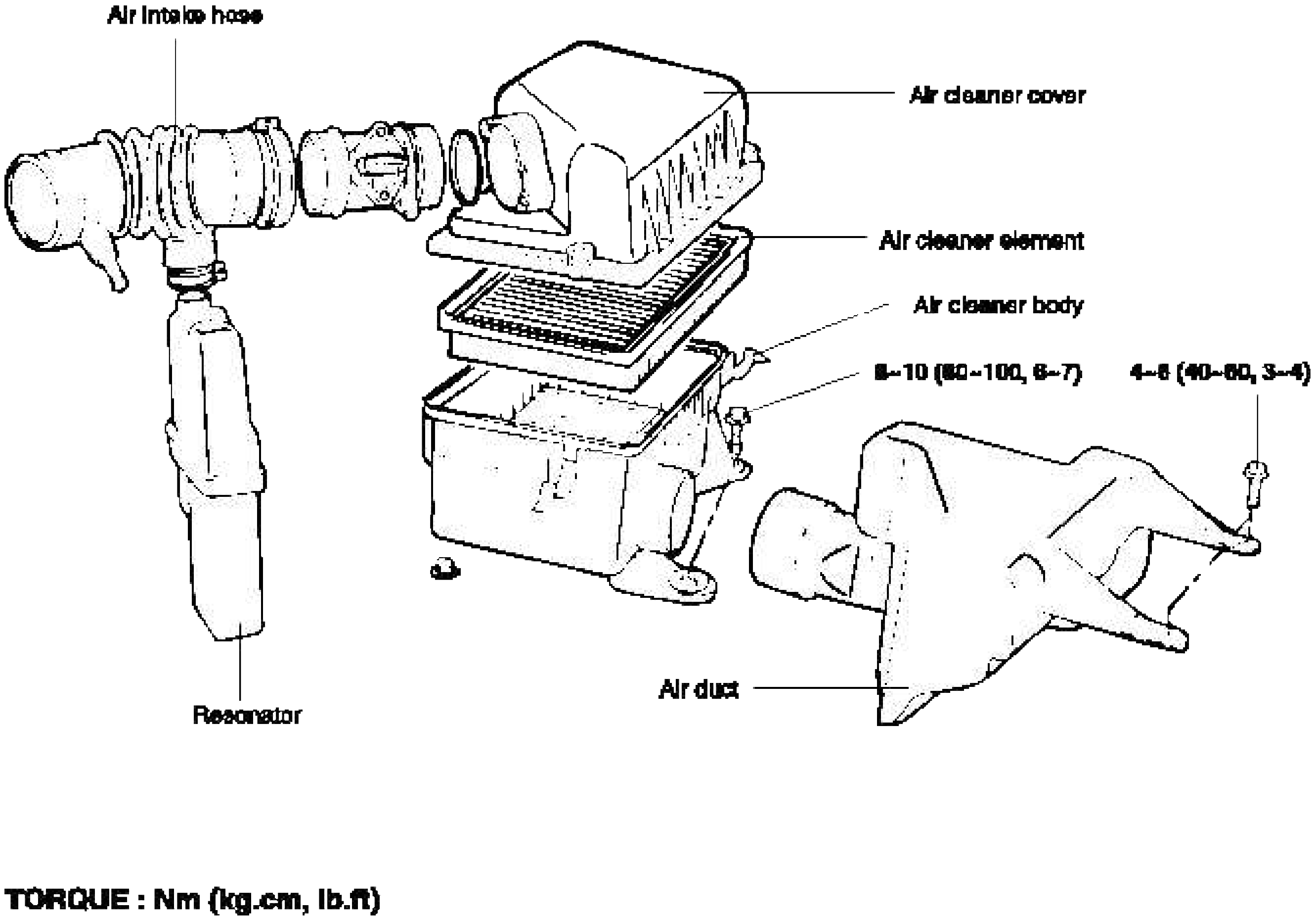
9. Install the oil pan and tighten the bolts to the specified torque.

Tightening torque
Oil pan bolt : 10 ~ 12 Nm (100 ~ 120 kg.cm, 7 ~ 9 lb.ft)



Engine Mechanical System > Intake And Exhaust System > Air Cleaner > Components and Components Location

COMPONENTS

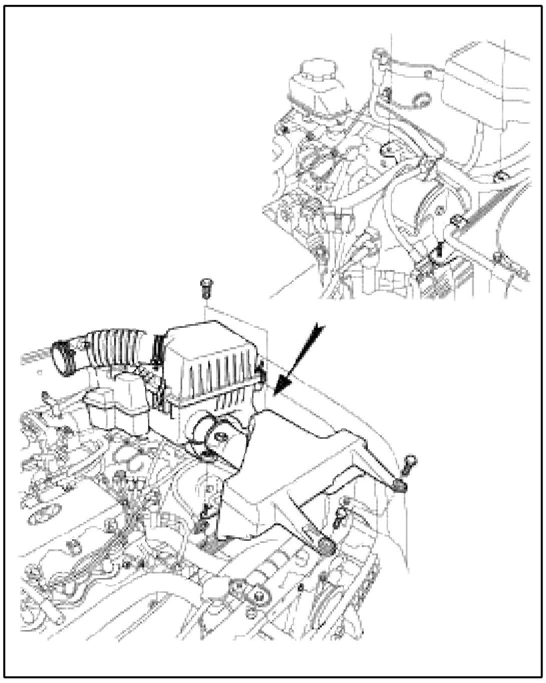

Air intake hose
Air cleaner cover
Air cleaner element
Air cleaner body
8~10 (80~100, 6~7)
4~6 (40~60, 3~4)
Resonator
Air duct
TORQUE : Nm (kg.cm, lb.ft)

Engine Mechanical System > Intake And Exhaust System > Air Cleaner > Repair procedures

REMOVAL

1. Remove the air duct connected to the air cleaner.
2. Remove the air intake hose from the air cleaner side.
3. Remove the air cleaner cover and filter.

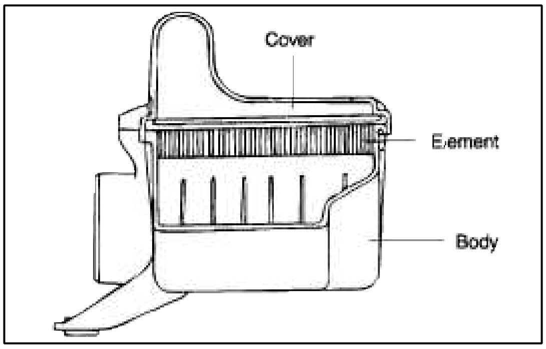
4. Remove the air cleaner mounting bolts and remove the air cleaner.



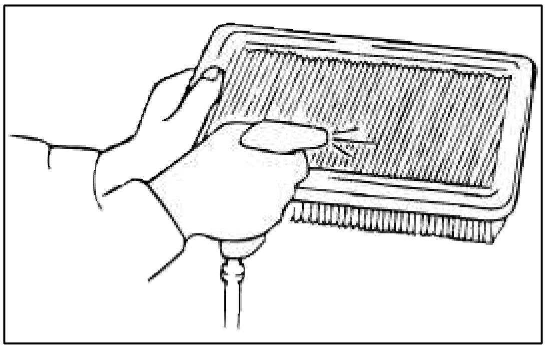
INSTALLATION

INSPECTION

1. Check the air cleaner body, cover, and filter for distortion, corrosion or damage.

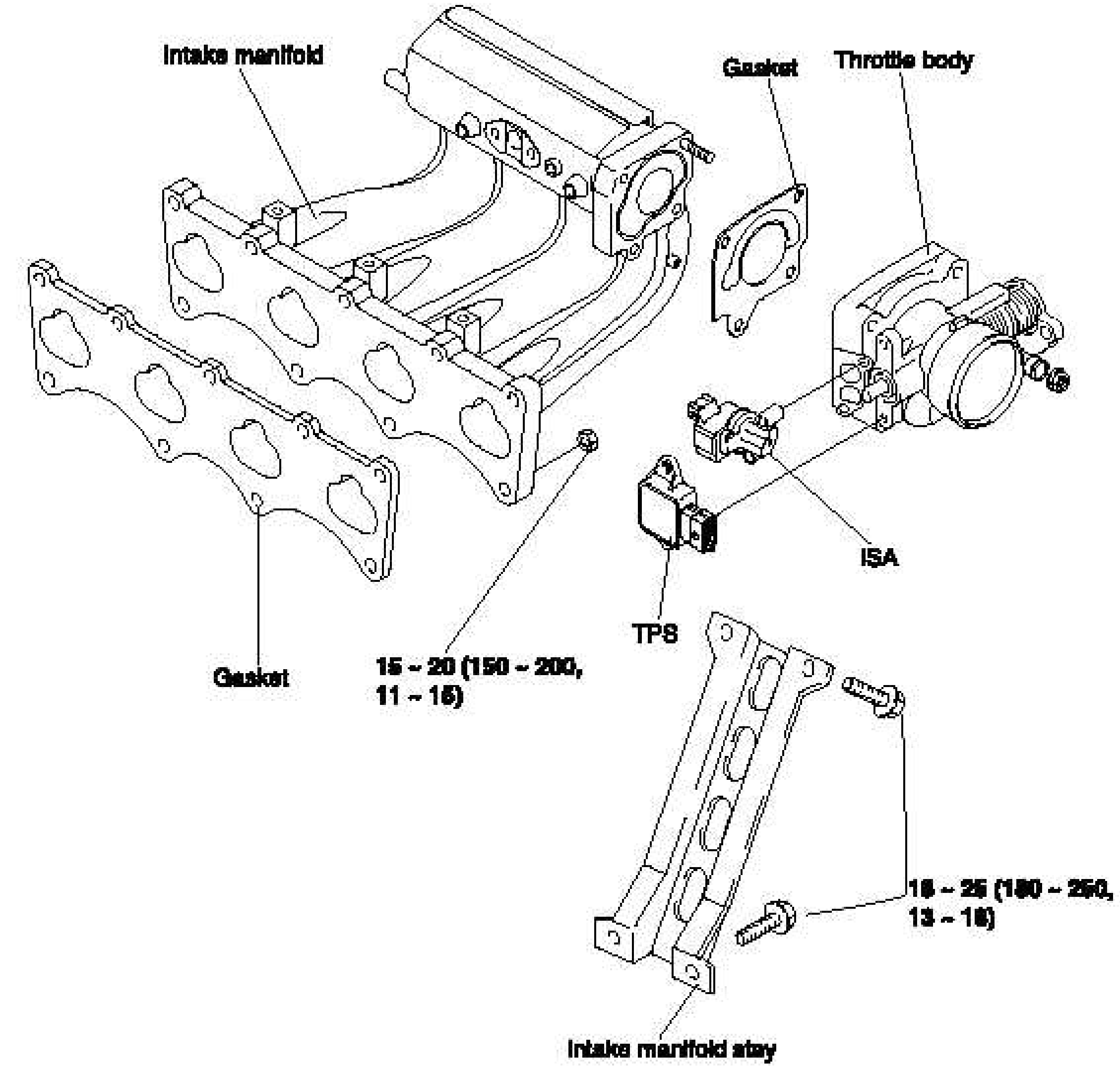


2. Check the air duct for damage.
3. Check the resonator for distortion or damage.
4. Check the air cleaner filter for restrictions, contamination or damage.
   If the filter is slightly restricted, remove dust and other contaminants by blowing air from the upper side through the filter.
5. Check the air cleaner housing for restrictions, contamination or damage.



Engine Mechanical System > Intake And Exhaust System > Intake Manifold > Components and Components Location

COMPONENTS

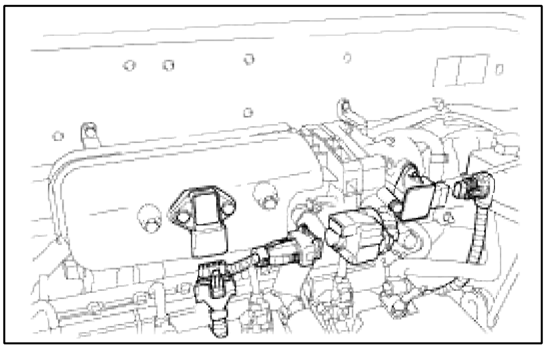

Intake manifold
Gasket
Throttle body
ISA
TPS
Gasket
15 ~ 20 (150 ~ 200, 11 ~ 15)
15 ~ 25 (150 ~ 250, 13 ~ 18)
Intake manifold stay

TORQUE : Nm (kg.cm, lb.ft)

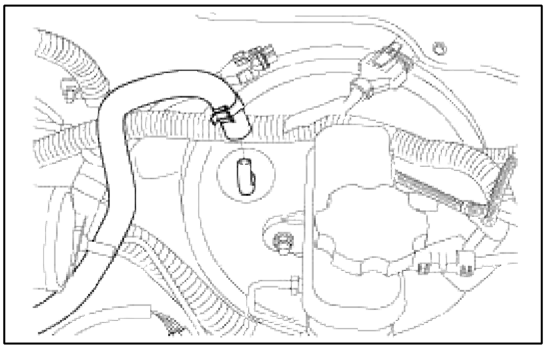
Engine Mechanical System > Intake And Exhaust System > Intake Manifold > Repair procedures

REMOVAL

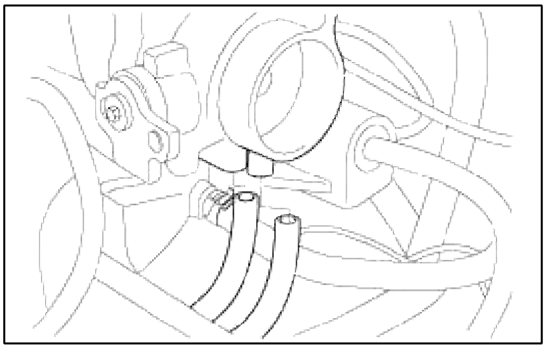
1. Disconnect the ISA, TPS and MAP sensor.



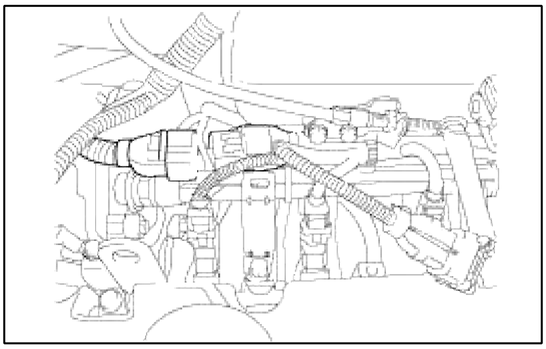
2. Remove the intake air hose connected to the throttle body.
3. Remove the accelerator cable.
4. Remove the P.C.V. hose and brake booster vacuum hose.



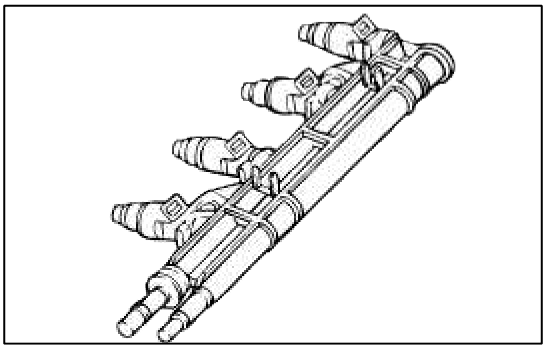
5. Remove the coolant hose connections from the throttle body.



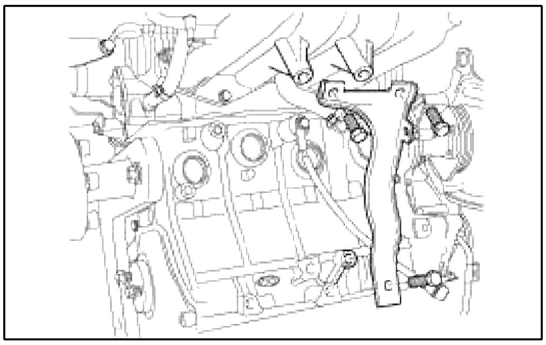
6. Disconnect the fuel injector harness connector.



7. Remove the delivery pipe and fuel injectors from the intake manifold.



8. Remove the surge tank stay.



9. Remove the intake manifold.

INSTALLATION

1. Install the delivery pipe with the fuel injectors attached.

> **CAUTION**
>
> Be careful not to drop the injectors when removing the delivery pipe.

2. Ensure that insulators are correctly inserted into the delivery pipe hole.

INSPECTION

SURGE TANK

Check the surge tank for defects or cracks.

Replace if necessary.

INTAKE MANIFOLD

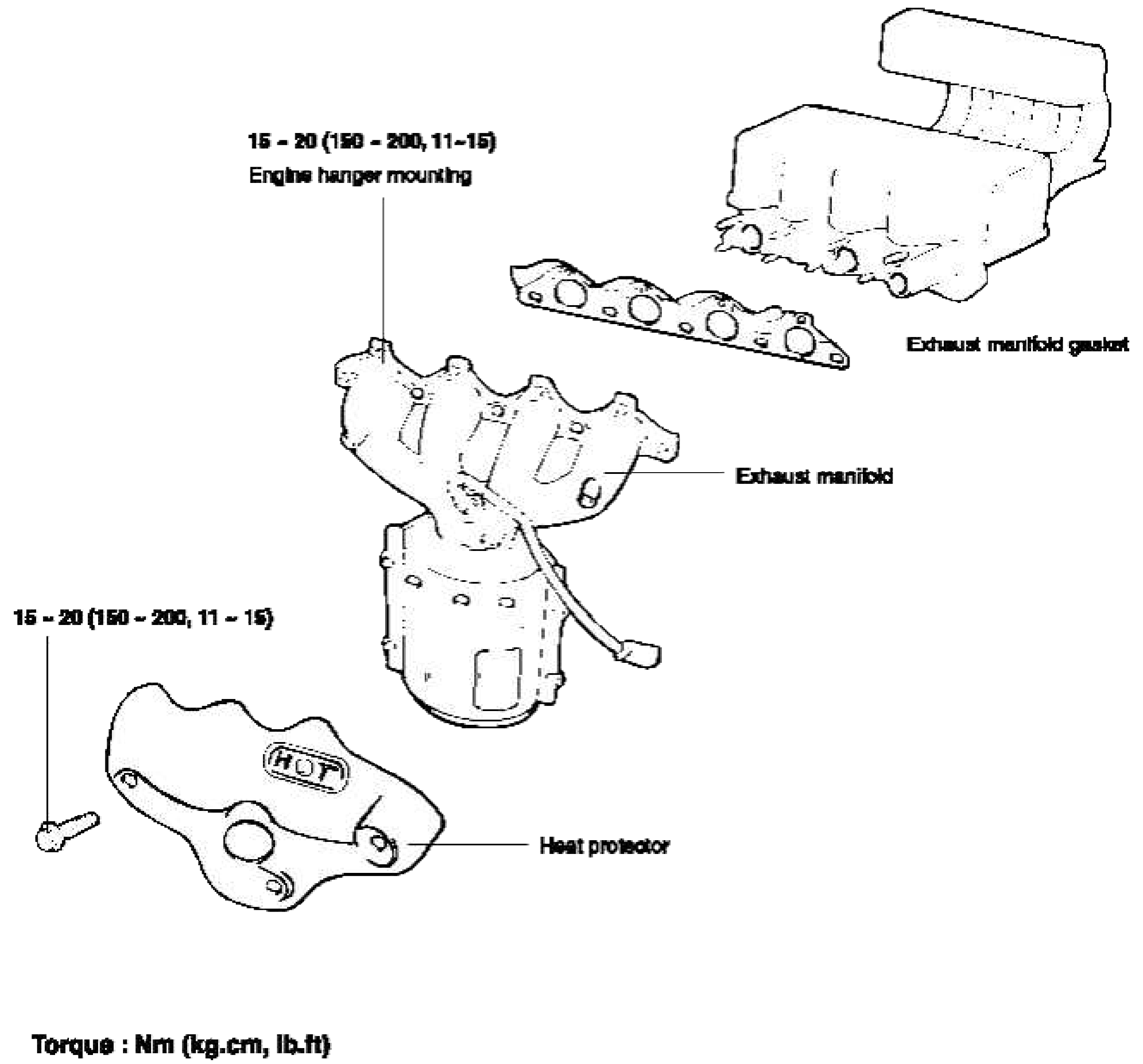
Check for damage or cracking of any part.

AIR HOSE

Check for damage or cracking of any part.

Engine Mechanical System > Intake And Exhaust System > Exhaust Manifold > Components and Components Location

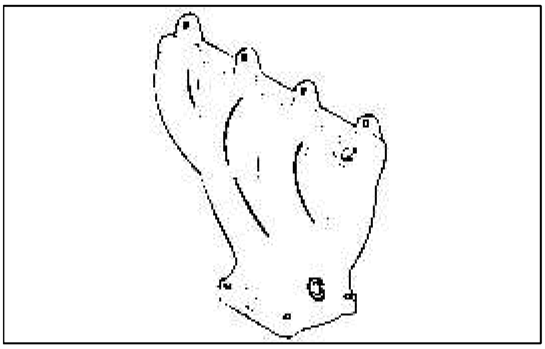
COMPONENTS


15 ~ 20 (150 ~ 200, 11~15)
Engine hanger mounting
Exhaust manifold gasket
Exhaust manifold
15 ~ 20 (150 ~ 200, 11 ~ 15)
HOT
Heat protector
Torque : Nm (kg.cm, lb.ft)

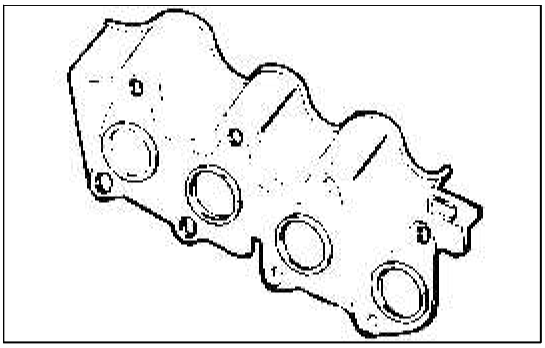
Engine Mechanical System > Intake And Exhaust System > Exhaust Manifold > Repair procedures

INSPECTION

EXHAUST MANIFOLD

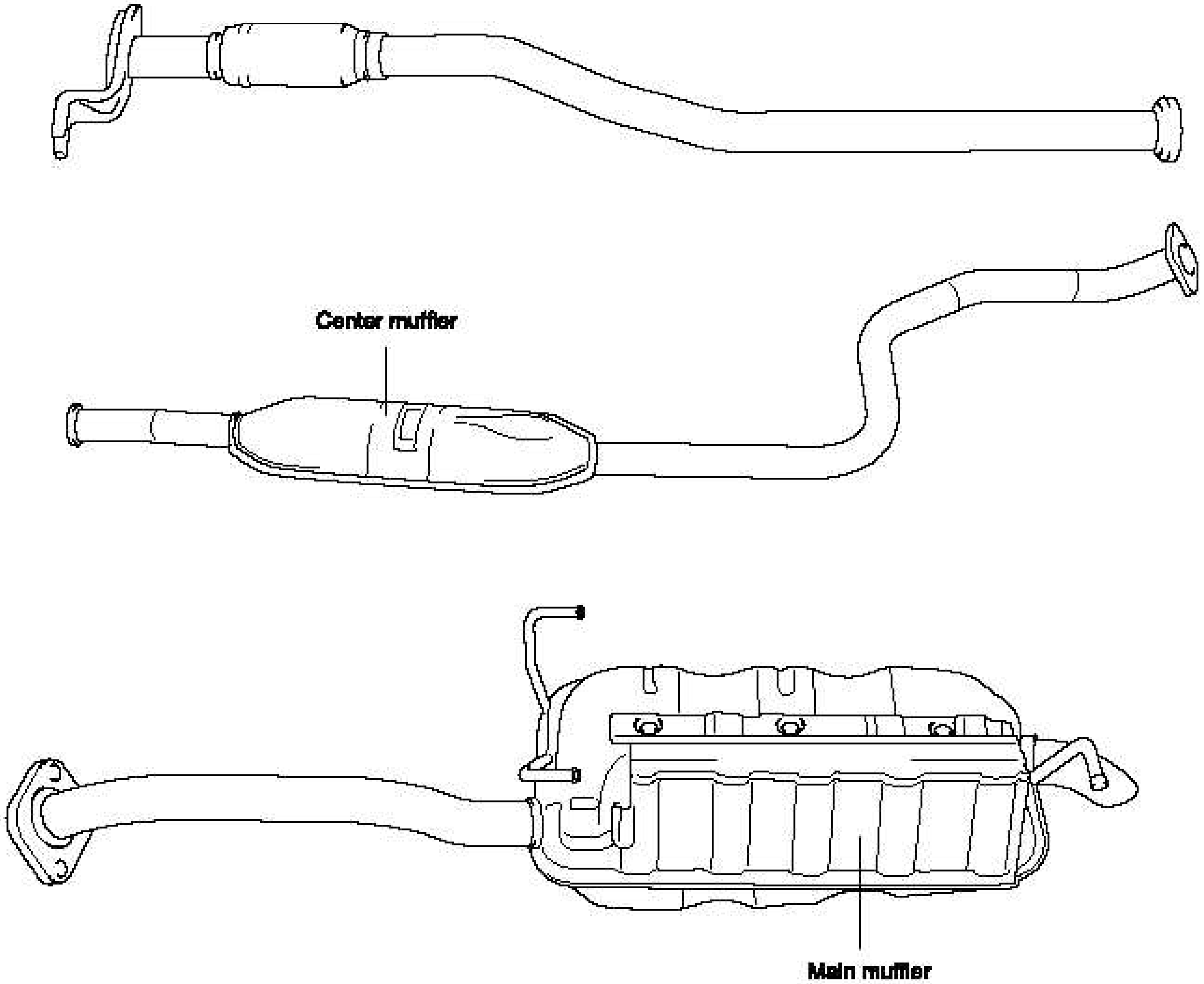


EXHAUST MANIFOLD GASKET



Engine Mechanical System > Intake And Exhaust System > Muffler > Components and Components Location

COMPONENTS


Center muffler
Main muffler

Engine Mechanical System > Intake And Exhaust System > Muffler > Repair procedures

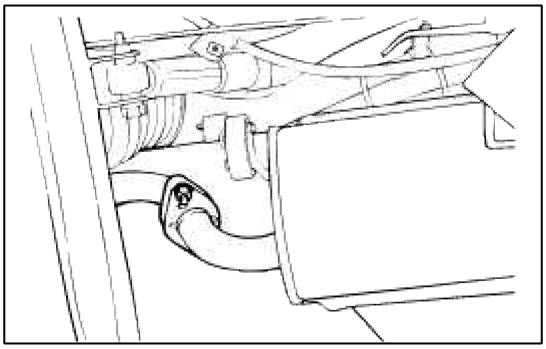
REMOVAL

TAIL PIPE

CAUTION

Before removing or inspecting the exhaust system, ensure that it has cooled sufficiently.

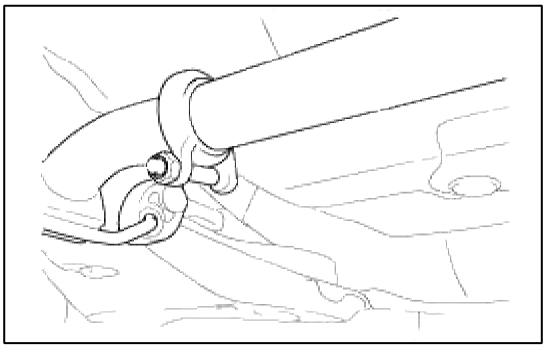
1. Disconnect the tail pipe muffler from the center muffler.



2. Remove the rubber hangers and take out the tail pipe.

CENTER PIPE

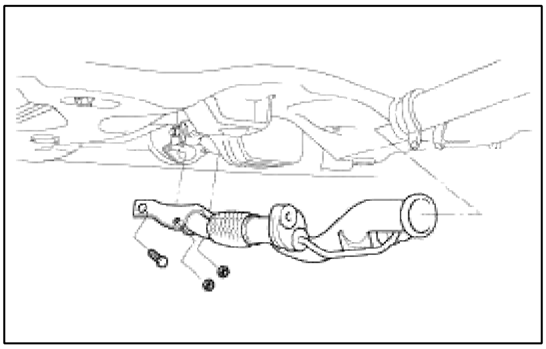
1. Remove the center muffler assembly from the tail pipe.
2. Remove the rubber hanger, then remove the center muffler.



CATALYTIC CONVERTER

FRONT EXHAUST PIPE

1. Remove the front exhaust pipe from the catalytic converter (unleaded vehicle) or exhaust manifold (leaded vehicle).



2. Remove the front exhaust pipe clamp bolt and remove the center muffler mounting nut.

INSTALLATION

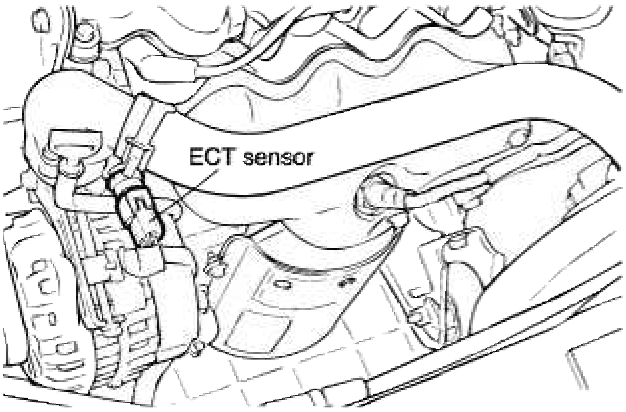
1. Install the catalytic converter assembly, front exhaust pipe, center exhaust pipe and the tail pipe. In that specific order.
2. Tighten the parts securely. Make sure there is no interference with any body components.

INSPECTION

1. Check the mufflers and pipes for corrosion and damage.
2. Check the rubber hanger and bands for deterioration and cracks.

Engine Mechanical System > Troubleshooting > P0128

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Coolant temperature profile check	● Contaminated, deterriorated or damaged ETCS ● Faulty thermostat ● Foreign materials fouled ETCS ● Faulty ECTS ● Faulty PCM
Threshold value	● Max. coolant temp. – current coolant temp. < 4.5 degC(40.1 °F)	
Enable Conditions	● Ambient temperature (model) 0-45 degC(32 °F~113 °F) ● Engine speed > 640 rpm ● Integrated air mass > 0.5 kg ● Coolant temperature at start 0-45 degC(32 °F~113 °F) ● Coolant temperature > 97 degC(206.6 °F) ● Accumulated air mass > limit f(tmst, tum)	
Diagnostic Time	● 1 sec	
Fail Safe		

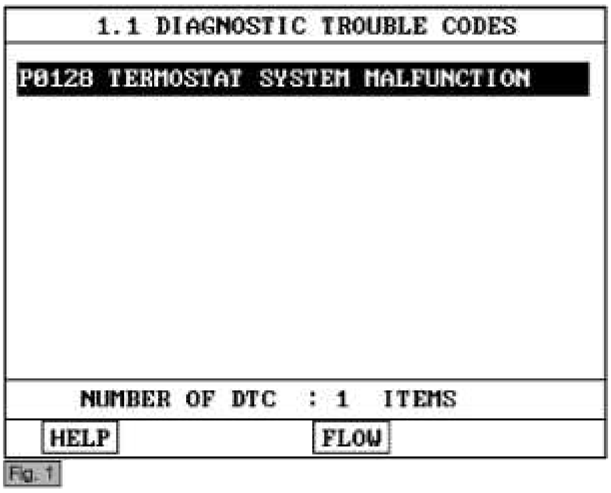
NOTE

If any codes relating to ECTS, IATS circuits are present,do all repairs associated with those codes before proceeding with this troubleshooting procedure.

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "ECTS signal" parameter on the scantool.

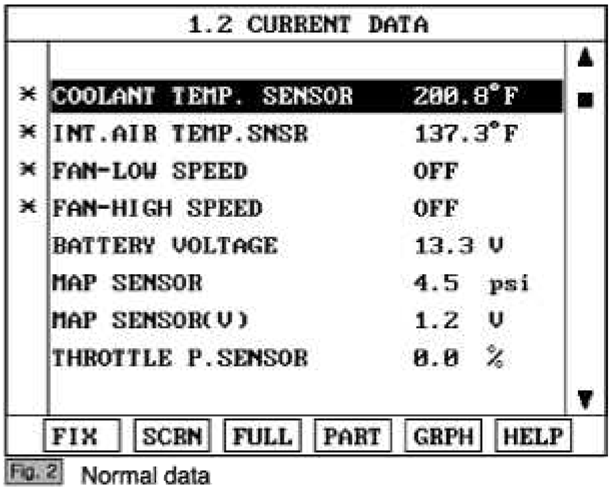


```
1.1 DIAGNOSTIC TROUBLE CODES

P0128 TERMOSTAT SYSTEM MALFUNCTION

NUMBER OF DTC  : 1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* COOLANT TEMP. SENSOR      200.8°F
* INT.AIR TEMP.SNSR         137.3°F
* FAN-LOW SPEED             OFF
* FAN-HIGH SPEED            OFF
  BATTERY VOLTAGE           13.3 V
  MAP SENSOR                4.5  psi
  MAP SENSOR(V)             1.2  V
  THROTTLE P.SENSOR         0.0  %
```

Fig. 2 Normal data

> **NOTE**
>
> If the output data changes as temoerature changes,the sensor is good
> If the ECTS output is in inverse proportion to water temperature,the sensor is normal.

Service standard
When ECT is 0°C (32°F) : 4.27 ± 0.3 V
When ECT is 20°C(68°F) : 3.44 ± 0.3 V
When ECT is 40°C(104°F) : 2.72 ± 0.3 V
When ECT is 80°C(176°F) : 1.25 ± 0.3 V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification vehicle Repair" procedure.

NO

Go to ""Component Inspection" procedure.

COMPONENT INSPECTION

1. Cooling System inspection
   (1) Check cooling system coolant level and fill if low.

   (2) Check for a proper cooling system operation. Especially check that cooling and condenser fan working normally.

   (3) Remove the thermostat and check the following items:
   1) Stuck or damaged Full open lift : 8.5mm(0.33 in) or more
   2)Verify the temperature at which the valve begins to open.Initial valve opening temperature : 82°C(179.6°F)
   Full valve opening temperature : 95°C(203°F)

   (4) Is a problem found?

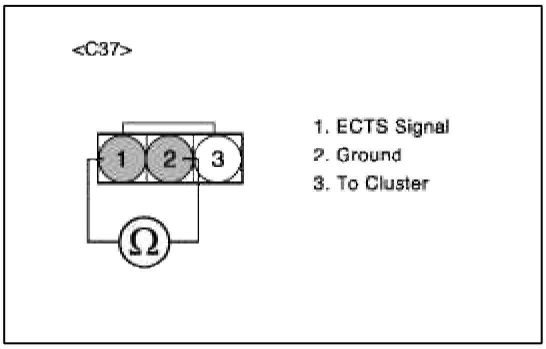
   YES

   Repair as necessary and go to "Verification vehicle Repair" procedure

   NO

   Go to "Check ECTS" as below.

2. Check ECTS
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Does each resistance indicate continuity circuit?

   YES

   Go to "Check PCM" as below.

   NO

   Open circuit ECTS .
   Repair as necessary and then go to "Verification of Vehicle Repair" procedure

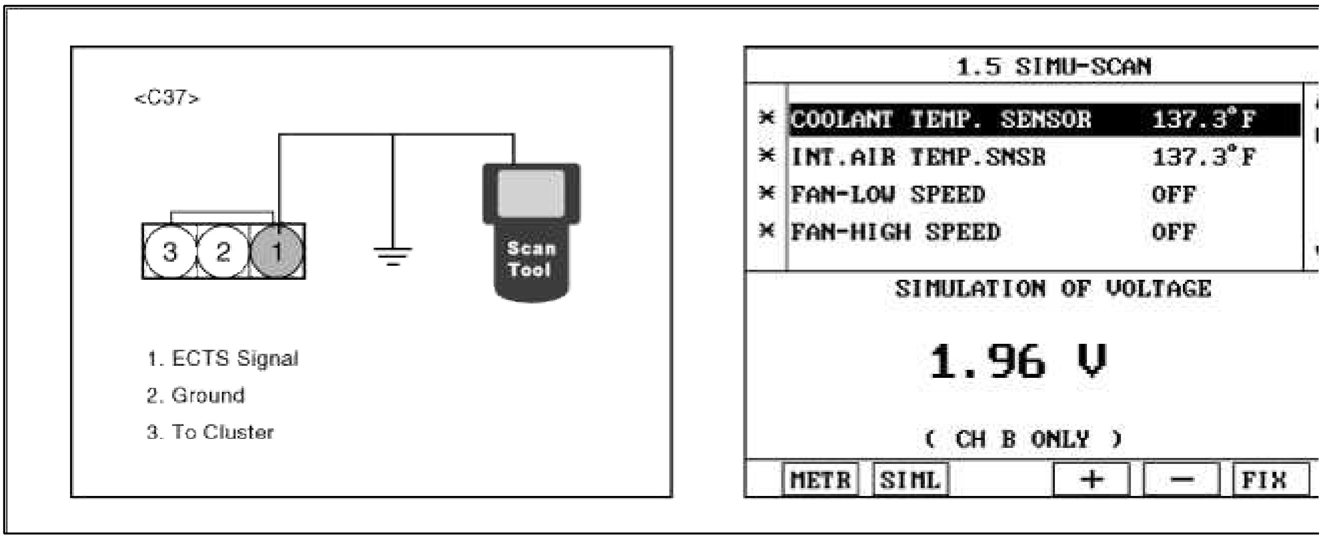
3. Check PCM
   The purpose of checking ECM is to determine whether there is any malfunction of PCM .
   (1) Ignition "OFF"

   (2) Connect Scantool and Engine "ON "

   (3) Select simulation function on scantool.

   (4) Simulate voltage at terminal 1 of ECT sensor signal connector.

(5) Verify ECTS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



1.5 SIMU-SCAN

× COOLANT TEMP. SENSOR 137.3°F
× INT.AIR TEMP.SNSR 137.3°F
× FAN-LOW SPEED OFF
× FAN-HIGH SPEED OFF

SIMULATION OF VOLTAGE

1.96 V

(CH B ONLY)

(6) Is ECT sensor signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

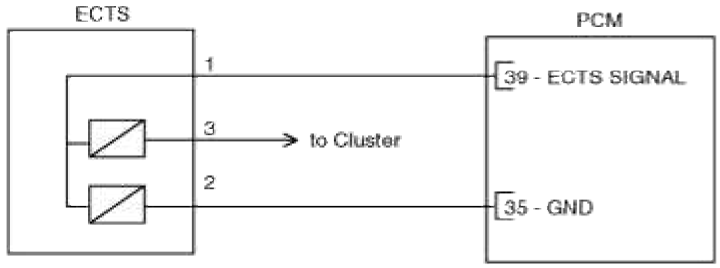
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

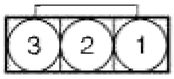
[CIRCUIT DIAGRAM]


ECTS
PCM
1
3
2
to Cluster
39 - ECTS SIGNAL
35 - GND

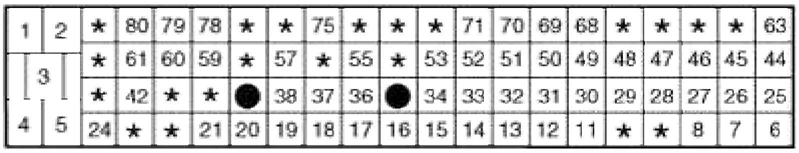
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM terminal 39	ECTS signal
2	PCM terminal 35	Sensor ground
3	Cluster	-

[HARNESS CONNECTORS]



ECTS

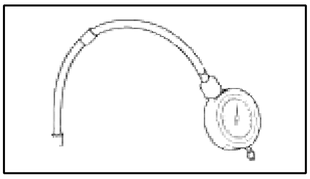
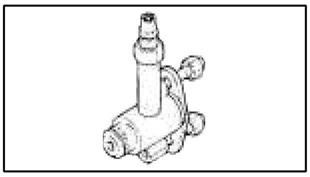
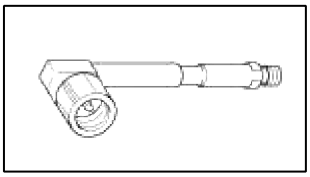

1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ ● 38 37 36 ● 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6

PCM

ACCENT(LC) > 2005 > G 1.5 SOHC > Fuel System

Fuel System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and name)	Illustration	Application
09353-24100 Fuel pressure gauge & hose		Connection of fuel pressure gauge to delivery pipe for measurement of fuel pressure.
09353-38000 Fuel pressure gauge adaptor		
09353-24000 Fuel pressure gauge connector		

Fuel System > General Information > Description and Operation

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE

DTC NO.	CONTENT	MIL
P0030	Heated Oxygen Sensor Heater Control Circuit (Bank 1 / Sensor 1)	O
P0031	Heated Oxygen Sensor Heater Circuit Low (Bank 1 / Sensor 1)	O
P0032	Heated Oxygen Sensor Heater Circuit High (Bank 1 / Sensor 1)	O
P0036	Heated Oxygen Sensor Heater Control Circuit (Bank 1 / Sensor 2)	O
P0037	Heated Oxygen Sensor Heater Circuit Low (Bank 1 / Sensor 2)	O
P0038	Heated Oxygen Sensor Heater Circuit High (Bank 1 / Sensor 2)	O
P0106	Manifold Absolute Pressure / Barometric Pressure Circuit Range/Performance	O
P0107	Manifold Absolute Pressure / Barometric Pressure Circuit Low Input	O
P0108	Manifold Absolute Pressure / Barometric Pressure Circuit High Input	O
P0111	Intake Air Temperature Circuit Range / Performance	O
P0112	Intake Air Temperature Circuit Low Input	O
P0113	Intake Air Temperature Circuit High Input	O
P0116	Engine Coolant Temperature Circuit Range / Performance	O
P0117	Engine Coolant Temperature Circuit Low Input	O
P0118	Engine Coolant Temperature Circuit High Input	O
P0121	Throttle Pedal Position Circuit Range / Performance Problem	O

P0122	Throttle / Pedal Position Circuit Low Input	O
P0123	Throttle / Pedal Position Circuit High Input	O
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	O
P0128	Coolant Thermostat (Coolant Temp. below Thermostat Regulating Temp.)	O
P0130	Heated Oxygen Sensor Circuit (Bank 1 / Sensor 1)	O
P0131	Heated Oxygen Sensor Circuit Low Voltage (Bank 1 / Sensor 1)	O
P0132	Heated Oxygen Sensor Circuit High Voltage (Bank 1 / Sensor 1)	O
P0133	Heated Oxygen Sensor Circuit Slow Response (Bank 1 / Sensor 1)	O
P0134	Heated Oxygen Sensor Circuit No Activity Detected (Bank 1 / Sensor 1)	O
P0136	Heated Oxygen Sensor Circuit (Bank 1 / Sensor 2)	O
P0137	Heated Oxygen Sensor Circuit Low Voltage (Bank 1 / Sensor 2)	O
P0139	Heated Oxygen Sensor Circuit Slow Response (Bank 1 / Sensor 2)	O
P0140	Heated Oxygen Sensor Circuit No Activity Detected (Bank 1 / Sensor 2)	O
P0230	Fuel Pump Primaty Circuit	X
P0261	Cylinder 1 - Injector Circuit Low	O
P0262	Cylinder 1 - Injector Circuit High	O
P0264	Cylinder 2 - Injector Circuit Low	O
P0265	Cylinder 2 - Injector Circuit High	O
P0267	Cylinder 3 - Injector Circuit Low	O
P0268	Cylinder 3 - Injector Circuit High	O
P0270	Cylinder 4 - Injector Circuit Low	O
P0271	Cylinder 4 - Injector Circuit High	O
P0300	Random/Multiple Cylinder Misfire Detected	O
P0301	Cylinder 1 - Misfire detected	O
P0302	Cylinder 2 - Misfire detected	O
P0303	Cylinder 3 - Misfire detected	O
P0304	Cylinder 4 - Misfire detected	O
P0325	Knock Sensor 1 Circuit Malfunction	X
P0335	Crankshaft Position Sensor Circuit Malfunction	O
P0336	CKP Circuit Range/Performance (More Reference Mark)	O
P0340	CMP Circuit Malfunction(Bank1)	O
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	O
P0441	Evap. Emission Ctrl. System Incorrect Purge Flow	O
P0442	Evap. Emission System - Leak Detected (small leak)	O
P0444	Evap. Emission System - Purge Ctrl. Valve Circuit Open	O
P0445	Evap. Emission System - Purge Ctrl. Valve Circuit Shorted	O

P0461	Fuel Level Sensor Circuit Range/Performance	O
P0462	Fuel Level Sensor Circuit Low Input	O
P0463	Fuel Level Sensor Circuit High Input	O
P0464	Fuel Level Sensor Circuit Intermittent	O
P0501	Vehicle Speed Sensor Range / Performance	O
P0502	Vehicle Speed Sensor Circuit Low Input	O
P0503	Vehicle Speec Sensor Circuit	O
P0506	Idle Control System - RPM lower than expected	O
P0507	Idle Control System - RPM higher than expected	O
P0562	System Voltage Low	O
P0563	System Voltage High	O
P0605	Internal Control Module ROM Error	O
P0645	Vehicle Speed Sensor Circuit	X
P0650	Malfunction Indicator Lamp(MIL) Control Circuit Malfunction	X
P1307	Acceleration Sensor Range/Performance	O
P1308	Acceleration Sensor Circuit Low Input	O
P1309	Acceleration Sensor Circuit High Input	O
P1404	DMTL Heater Malfunction	O
P1505	Idle Charge Actuator Signal Low of Coil #1	O
P1506	Idle Charge Actuator Signal High of Coil #1	O
P1507	Idle Charge Actuator Signal Low of Coil #2	O
P1508	Idle Charge Actuator Signal High of Coil #2	O
P1624	Cooling Fan Relay Circuit Low Input	X
P1625	Cooling Fan Relay Circuit High Input	X
P1765	Torque Reduction Abnormal	X
P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	O
P2097	Post Catalyst Fuel Trim System Too Righ (Bank 1)	O
P2187	Fuel Trim Malfunction - System Too Lean at ldle (Additive)	O
P2188	Fuel Trim Malfunction - System Too Rich at ldle	O
P2191	Fuel Trim Malfunction - System Too Lean at Higher Load (Multiple)	O
P2192	Fuel Trim Malfunction - System Too Rich at Higher Load	O
P2400	Power Stage (DMTL Motor) - Disconnected	O
P2401	Power Stage (DMTL Motor) - Short to ground	O
P2402	Power Stage (DMTL Motor) - Short to battery voltage	O
P2404	DMTL Malfunction - Pump Motor Current (Current at valve check)	O
P2405	DMTL Malfunction - Pump Motor Current (Less than 12mA)	O

P2406	DMTL Malfunction - Pump Motor Current (Less than 40mA)	O
P2407	DMTL Malfunction - Number of unfinished leak detection due to current change	O
P2418	Power Stage (DMTL VALVE) - Disconnected	O
P2419	Power Stage (DMTL VALVE) - Short to ground	O
P2420	Power Stage (DMTL VALVE) - Short to battery voltage	O

NOTE

O : MIL ON & FAULT CODE MEMORY
X : MIL OFF & FAULT CODE MEMORY

Fuel System > General Information > Troubleshooting

BASIC TROUBLESHOOTING

1. Power supply
   A. Battery
   B. Fusible link
   C. Fuse
2. Body ground
3. Fuel supply
   A. Fuel line
   B. Fuel filter
   C. Fuel pump
4. Ignition system
   A. Spark plug
   B. High-tension cable
   C. Ignition coil
5. Emission control system
   A. PCV system
   B. Vacuum leak
6. Others
   A. Ignition timing
   B. Idle speed

TROUBLESHOOTING GUIDE CHART

Main Symptoms	STARTING							Poor Idling					Poor Driving	
	Unable to start			Difficult to start										
Sub-Symptoms / Check points	Engine does not turn over	Starter runs but engine does not turn over	Incomplete combustion	Engine turns over	Always	When the engine is cold	When the engine is hot	Incorrect fast idle	High idle speed	Low idle speed	Rough idling	Engine hesitates or accelerates poorly	Surging	Knocking
Starter relay	1													
Starter	2	2		1										
Park/Neutral SW [A/T] or Clutch start SW [M/T]	3													
Flywheel [M/T] or Drive plate [A/T]		4												
Mass air flow sensor circuit			3							3	10	7		
Idle speed control actuator			4		3	3	3	3	3	2	7			2
Fuel pressure regulator			5		5	5	5				4	11	1	
ECT sensor circuit			6		4	1	1	2	2	1	2	8	6	
Compression			7		8						8	5		
Piston rings			8		9						9			
Ignition timing					10						11	14		
Timing mark			9								12			
Injectors			10		13	8	8		7	4	13	15	4	
PCM			11		14	9	9	4	8	5	14	16	5	
A/C circuit				2					6					
Connecting rod bearing				3										
Crankshaft bearing				4										
Fuel quality					1	2	2				1	3	3	
Spark plugs					2						3	4	2	
Fuel pump					6	6	6				5	12		
Fuel lines					7	7	7				6	13		
Ignition circuit			2		11									3
Intake air temp. sensor circuit					12	4	4		4			9		1
Accelerator pedal link								1	1					
TP Sensor circuit									5			6		
Cylinder head											15			
Clutch [M/T]												1		
Brakes not releasing properly												2		
Oxygen sensor circuit												10		
Crankshaft position sensor		3												
Battery voltage		1	1											

Main Symptoms	Engine Stalls				Others			Refueling
Sub-Symptoms Check points	Soon after starting	After accelerator pedal is depressed	After accelerator pedal is released	During A/C ON	Excessive fuel consumption	Engine overheats	Engine too cool	Hard to refuel Overflowing spit-Back
Fuel quality	1							
Fuel pressure regulator	2	4			2			
Fuel pump	3							
Fuel lines	4	5						
ISC actuator	5		1	2				
MAF sensor circuit	6	1	2		13			
ECT sensor circuit	7				11			
Injectors	8	6			10			
ECM	9	7	3	3	17			
TP Sensor circuit		2			12			
Spark plug		3			6	8		
A/C circuit				1	14			
Fuel leakage					1			
Accelerator pedal link					3			
Clutch [M/T]					4			
Brakes drag when pedal released					5			
Compression					7			
Piston ring					8			
Ignition timing					9			
Oxygen sensor circuit					15			
Intake air temp. sensor circuit					16			
Coolant leakage						1		
Cooling fan						2	1	
Thermo switch						3		
Radiator and radiator cap						4	2	
Thermostat						5		
Timing belt						6		
Engine coolant pump						7		
Oil pump						9		
Cylinder head						10		
Cylinder block						11		
ECT sender						12	3	
Crankshaft position sensor	11	8	4	4				
Fill vent valve hose-clogging								1
Canister fillter-Contamination								2
Fuel shut off valve-operation								3

NOTE

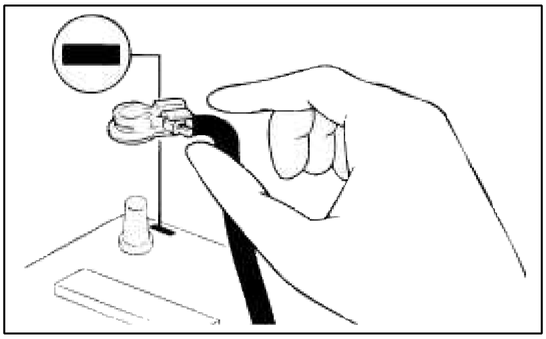
The number herein means the check order.

Fuel System > General Information > Repair procedures

REPLACEMENT

FUEL FILTER AND PUMP REPLACEMENT

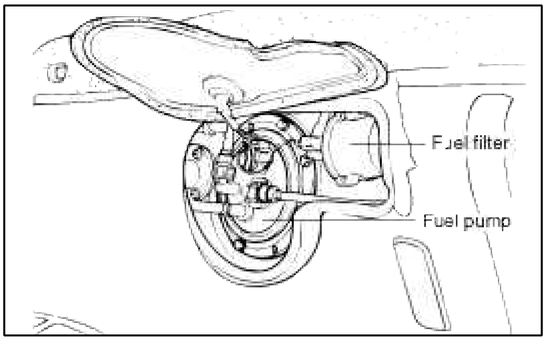
1. Reduce the internal pressure of the fuel lines and hoses by completing the following operations.
   - A. After removing the rear seat cushion, disconnect the fuel pump harness.
   - B. Start the engine. Allow it to stop by itself, then turn the ignition switch OFF.
   - C. Disconnect the battery negative (-) terminal.
   - D. Connect the fuel pump harness connector.



2. Remove the eye bolts while holding the fuel filter nuts securely.

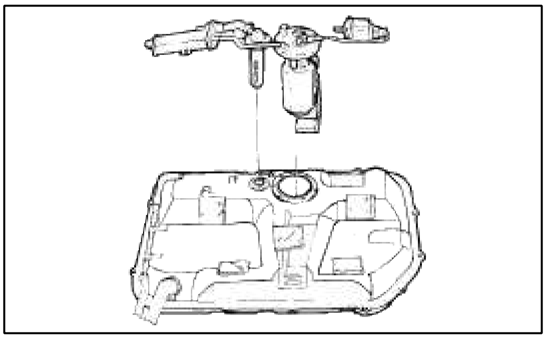
> **CAUTION**
>
> Cover the fuel filter with a shop towel to avoid residual gasoline from splashing.

3. Remove the fuel filter mounting bolts, then remove the fuel filter from the fuel filter clamp.
4. After replacing the fuel filter, check for fuel leaks.



FUEL SENDER REPLACEMENT

1. Remove the fuel tank cap to lower the fuel tank's internal pressure.
2. Remove the fuel sender mounting screws, then remove the fuel sender from the fuel tank.



INSPECTION

SERVICE ADJUSTMENT PROCEDURES

> **NOTE**
>
> Before adjusting, check that the spark plugs, injectors, idle speed control actuator (ISC actuator), compression etc. are normal.

CHECK CONDITIONS

- Engine coolant temperature is 80 to 95°C (176 to 205°F).
- Lights, electric cooling fan and all accessories are off.
- Transaxle is in neutral ("P" or "N" range for A/T vehicles).
- Steering wheel is in a straight forward position (Vehicles with power steering).

1. Install a tachometer to the primary coil side or connect the scan tool to the data link connector.
2. Start and run the engine at curb idle speed.
3. Run the engine for more than 5 seconds at an engine speed of 2,000 to 3,000 rpm. Then, run the engine at idle for 2 minutes.
4. Read the idling rpm.

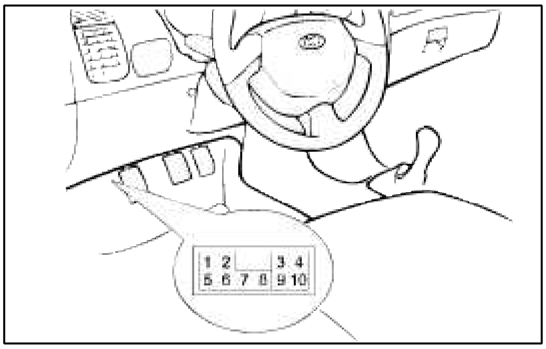
Idle speed
SOHC : 800 ± 100 rpm
DOHC : 800 ± 100 rpm

FUEL PUMP OPERATING CHECK

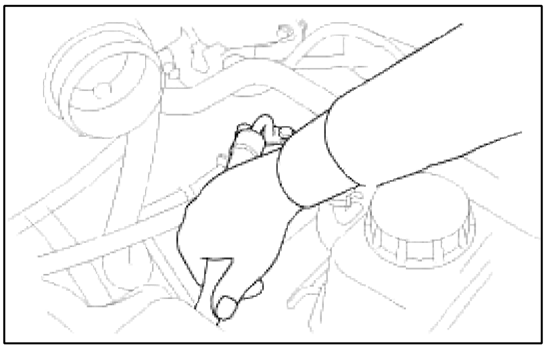
1. Turn the ignition switch OFF.
2. Apply battery voltage to the fuel pump drive connector to check that the pump operates.

NOTE

The fuel pump is an in-tank type and its operation is hard to hear without removing the fuel tank cap.

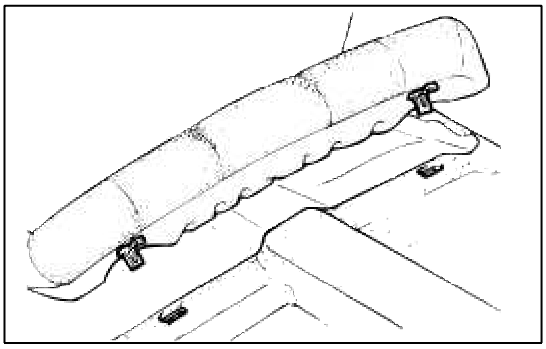


3. Pinch the hose to check that fuel pressure is felt.

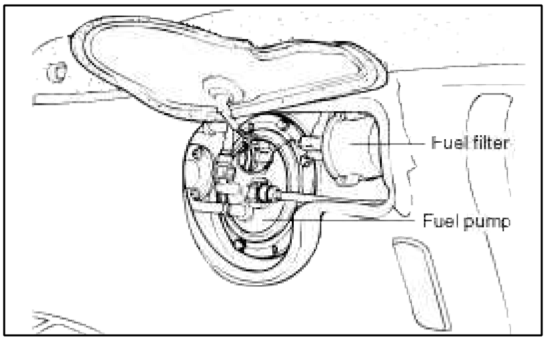


FUEL PRESSURE TEST

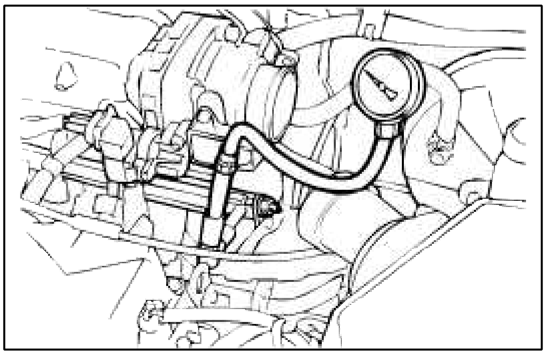
1. Press the two taps under the rear seat and raise the seat, then detach the inspection panel of the fuel pump.



2. To reduce the internal pressure of the fuel lines and hoses, first start the engine with the fuel pump disconnected and wait until it stops by itself.

> **NOTE**
>
> Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose, otherwise fuel will spill out.
>
> 
>

3. Disconnect the battery negative (-) terminal and then connect the fuel pump harness connector.
4. Using the fuel pressure gauge adapter (09353-24000, 09353-24100, 09353-38000), install the fuel-pressure gauge to the fuel rail. Tighten the bolt to the specified torque.



Tightening Torque

Fuel pressure gauge to fuel filter :

25 ~ 35 Nm (250 ~ 350 kg·cm, 18 ~ 26 lb·ft)

---

5. Connect the battery's negative (-) terminal.
6. Apply battery voltage to the terminal for the pump drive and activate the fuel pump. Then, with fuel pressure applied, check that there is no fuel leak from the pressure gauge or connections.
7. Start the engine and let it idle.
8. Measure the fuel pressure.

---

350 kPa (3.5 kg/cm², 49.8 psi)

---

9. If the result of the measurements made in steps (7) and (8) are not within the standard value, use the table below to determine the probable cause, and make the necessary repairs.

Condition	Probable cause	Remedy
Fuel pressure too low	1) Clogged fuel filter. 2) Fuel leak on the return side, caused by poor seating of the fuel-pressure regulator.	1) Replace fuel filter. 2) Replace fuel pump.
Fuel pressure too high	1) Sticking fuel-pressure regulator. 2) Clogged or bent fuel return hose or pipe.	1) Replace fuel pump. 2) Repair or replace hose or pipe.

10. Stop the engine and check for a change in the fuel pressure gauge reading, which should hold for approximately 5 minutes. If the gauge indication drops, observe the rate of drop. Determine and remove the causes according to the following table.

Condition	Probable cause	Remedy
Fuel pressure drops slowly after engine is stopped	1) Injector leak.	1) Replace injector.
Fuel pressure drops immediately after engine is stopped	1) The check valve within the fuel pump is open.	1) Replace fuel pump.

11. Reduce the pressure in the fuel line.
12. Disconnect the hose and the gauge.

CAUTION

Cover the hose connection with a shop towel to prevent splashing of fuel caused by residual fuel pressure in the fuel line.

13. Replace the O-ring at the end of the hose.
14. Connect the fuel hose to the delivery pipe and tighten with the specified torque.
15. Check for fuel leaks.

MFI SYSTEM INSPECTION

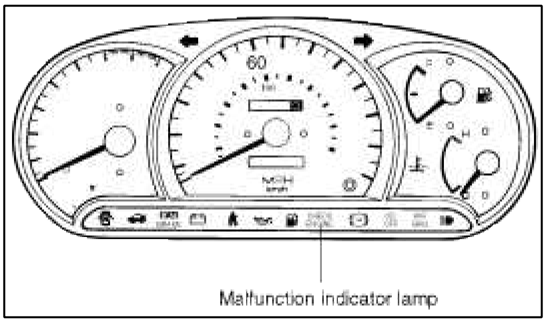
1. Engine is hard to start or does not start at all.
2. Unstable idle.
3. Poor driveability.

NOTE

- Before removing or installing any part, read the diagnostic trouble codes and then disconnect the battery negative (-) terminal.
- Before disconnecting the cable from battery terminal, turn the ignition switch to OFF. Removal or connection of the battery cable during engine operation or while the ignition switch is ON could cause damage to the ECM.
- The control harnesses between the ECM and heated oxygen sensor are shielded with the shielded ground wires to the body in order to prevent the influence of ignition noises and radio interference. When the shielded wire is faulty, the control harness must be replaced.
- When checking the generator for the charging state, do not disconnect the battery '+' terminal to prevent the ECM from damage due to the voltage
- When charging the battery with the external charger, disconnect the vehicle side battery terminals to prevent damage to the ECM

MALFUNCTION INDICATOR LAMP (MIL)

- Catalyst
- Fuel system
- Manifold Absolute Pressure (MAP) Sensor
- Intake Air Temperature Sensor
- Engine Coolant Temperature Sensor
- Throttle Position Sensor
- Upstream Oxygen Sensor
- Downstream Oxygen Sensor Heater
- Downstream Oxygen Sensor
- Upstream Oxygen Sensor Heater
- Injector
- Misfire
- Crankshaft Position Sensor
- Camshaft Position Sensor
- Purge Control Solenoid Valve
- Vehicle Speed Sensor
- Idle Control Valve
- Power Supply
- ECM
- MT/AT Encoding
- Acceleration Sensor
- MIL-on Request Signal
- Power Stage



1. After turning ON the ignition key, ensure that the light illuminatesfor about 5 seconds and then goes out.
2. If the light does not illuminate, check for an open circuit in theharness, a blown fuse or a blown bulb.

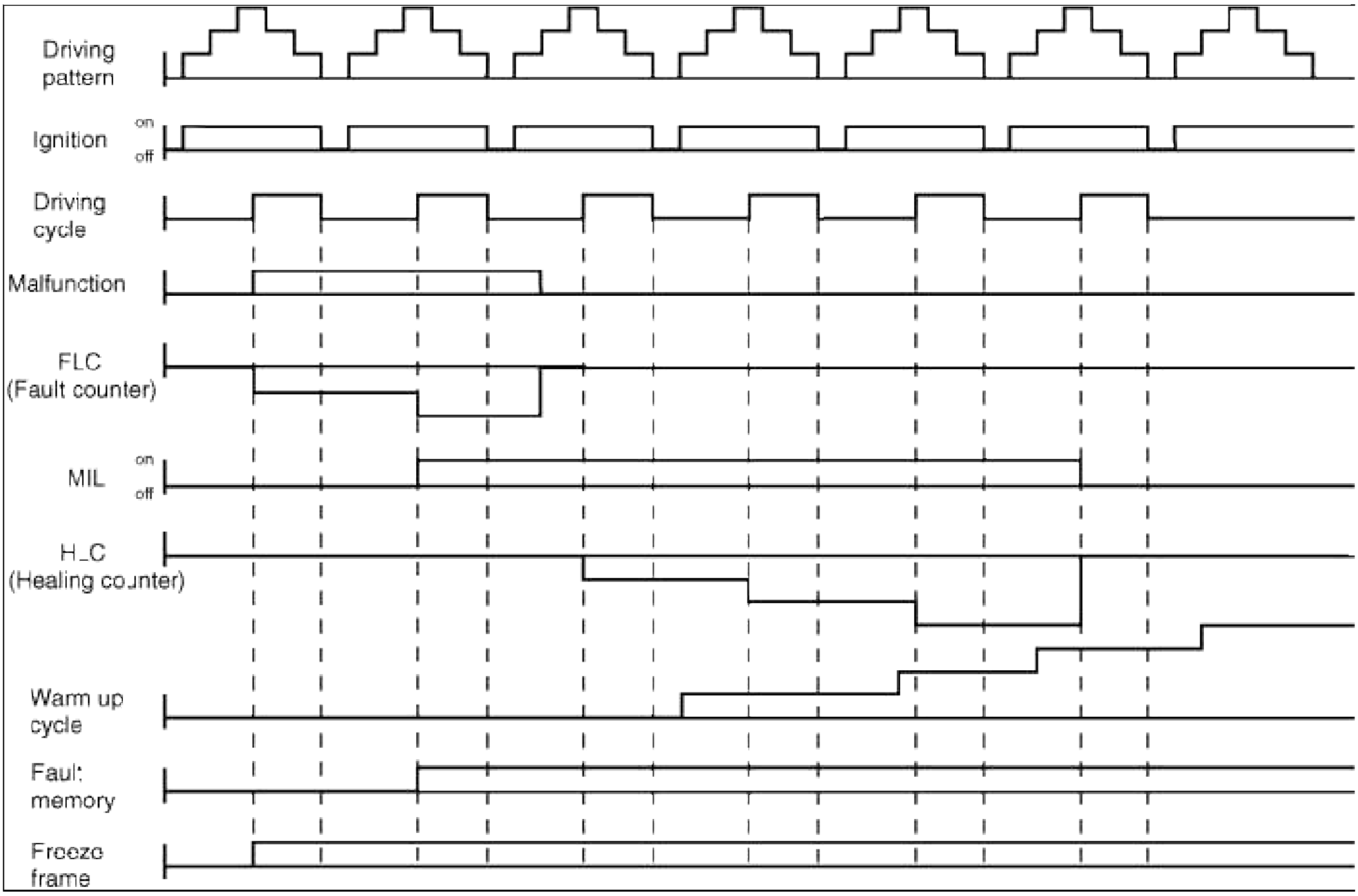
SELF-DIAGNOSIS

The ECM monitors the input/output signals (some signals at all timesand the others under specified conditions). When the ECM detects an irregularity,itrecords the diagnostic trouble code, and outputs the signal to the Data Linkconnector. The diagnosis results can be read with the MIL or HI-SCAN.Diagnostictrouble codes (DTC) will remain in the ECM as long as battery power is maintained.The diagnostic trouble codes will, however, be erased when the battery terminalor the engine control module (ECM) connector is disconnected or by Hi-Scan.

NOTE

If a sensor connector is disconnected with theignition switch turned on,the diagnostic trouble code (DTC) is recorded. Inthis case, disconnect the battery negative terminal (-) for 15 seconds ormore, and the diagnosis memory will be erased.

THE RELATION BETWEEN DTC AND DRIVING PATTERN


Driving pattern
Ignition
on
off
Driving cycle
Malfunction
FLC (Fault counter)
MIL
on
off
H_C (Healing counter)
Warm up cycle
Fault memory
Freeze frame

1. When the same malfunction is detected and maintained during twosequential driving cycles, the MIL will automatically illuminate.
2. The MIL will go off automatically if no fault is detected after3 sequential driving cycles.
3. A Diagnostic Trouble Code(DTC) is recorded in ECM memory whena malfunction is detected after two sequential driving cycles. The MIL willilluminate when the malfunction is detected on the second driving cycle. If a misfire is detected, a DTC will be recorded, and the MIL will illuminate,immediately after a fault is first detected.
4. A diagnostic Trouble Code(DTC) will automatically erase from ECMmemory if the same malfunction is not detected for 40 driving cycles.

> **NOTE**
>
> - A "warm-up cycle" means sufficient vehicle operation such thatthe coolant temperature has risen by at least 40 degrees Fahrenheit from enginestarting and reaches a minimum temperature of 160 degress Fahrenheit
> - A "driving cycle" consists of engine startup, vehicle operationbeyond the beginning of closed loop operation.

Fuel System > General Information > Specifications

SPECIFICATIONS (1.5 SOHC, 1.6 DOHC)

Items	Specifications
Engine displacement Engine Management System (EMS)	1.5ℓ, 1.6ℓ BOSCH
Fuel tank - Capacity Fuel filter Fuel pump	45ℓ (11.9 U.S. gal., 9.9 lmp.gal.) High pressure type Electrical, in-tank type
Input sensors Manifold absolute pressure (MAP) sensor - Type - Output voltage Throttle body - Throttle position sensor (TP Sensor) - Output voltage at idle - Output voltage at fully open Knock sensor Intake Air Temperature sensor (IAT Sensor) - Voltage EVAP Canister Purge solenoid valve - Resistance Engine coolant temperature sensor (ECT Sensor) - Voltage Heated oxygen sensor (HO2S) - Output voltage (V) Vehicle speed sensor Camshaft position sensor (CMP Sensor) - Output voltage (V) Crankshaft position sensor (CKP Sensor) - Output frequency (Hz)	Piezo-Resistivity type 0 ~ 5V Variable resister type 0.3 ~ 0.9V 4.5 ~ 5.2V Piezoelectric type Thermistor type 3.3 ~ 3.7V at 20°C (68°F) Duty type 26Ω Thermistor type 3.44V ± 0.3 at 20°C (68°F) 1.25V ± 0.3 at 80°C (176°F) Zirconia sensor (Heated) 0 ~ 1V Hall effect sensor Hall effect sensor 0 ~ 5V Magnetic inductive type Idle rpm : 600 ~ 900Hz 3000 rpm : 2700 ~ 3300Hz
Output actuators Injector - Type - Number - Coil resistance (Ω) Fuel pressure regulator - Regulator pressure Idle speed control actuator (ISC Actuator) - Type - Control frequency (Hz)	Electromagnetic type 4 15.9 ± 0.35Ω Bulit in Fuel Pump Assembly 350 kPa (3.57 kg/cm², 50.8 psi) Double coil type 100Hz

SERVICE STANDARD

Items	Engine	Specifications	Condition
Basic idle RPM	SOHC	800 ± 100	A/CON "ON" or "OFF (N-range)
	DOHC	800 ± 100	A/CON "ON" or "OFF (N-range)
Ignition timing (°) (at idle RPM)	SOHC	9° ± 5°	A/CON "OFF" (N-range)
	DOHC	9° ± 5°	A/CON "OFF" (N-range)

TIGHTENGING TORQUE

Items	Nm	Kg·cm	lb·ft
Delivery pipe installation	10 ~ 15	100 ~ 150	7 ~ 11
Heated oxygen sensor	50 ~ 60	500 ~ 600	37 ~ 44
Crankshaft position sensor installation bolts	9 ~ 11	90 ~ 110	7 ~ 8
Knock sensor installation bolt	16 ~ 25	160 ~ 250	12 ~ 18
Engine coolant temperature sensor (SOHC)	15 ~ 20	150 ~ 200	11 ~ 15
Engine coolant temperature sensor (DOHC)	25 ~ 30	250 ~ 300	18 ~ 22
Throttle position sensor installation bolts	1.5 ~ 2.5	15 ~ 25	1.1 ~ 1.8
Throttle body to surge tank bolts	15 ~ 20	150 ~ 200	11 ~ 15
Accelerator arm bracket	8 ~ 12	80 ~ 120	5.8 ~ 7.2
Fuel pressure gauge to fuel filter	25 ~ 35	250 ~ 350	18 ~ 26
Intake manifold	15 ~ 20	150 ~ 200	11 ~ 15
Accelerator bracket	8 ~ 12	80 ~ 120	5.8 ~ 7.2
MFI control relay	7 ~ 11	70 ~ 110	5.2 ~ 8.1

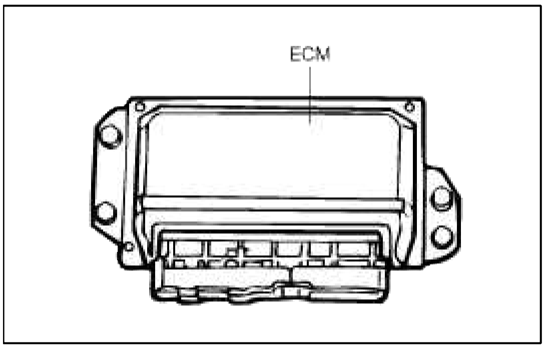
SEALANT

Engine coolant temperature sensor assembly	LOCTITE 962T or equivalent
Engine coolant temperature sender	Three bond No.2310 or equivalent

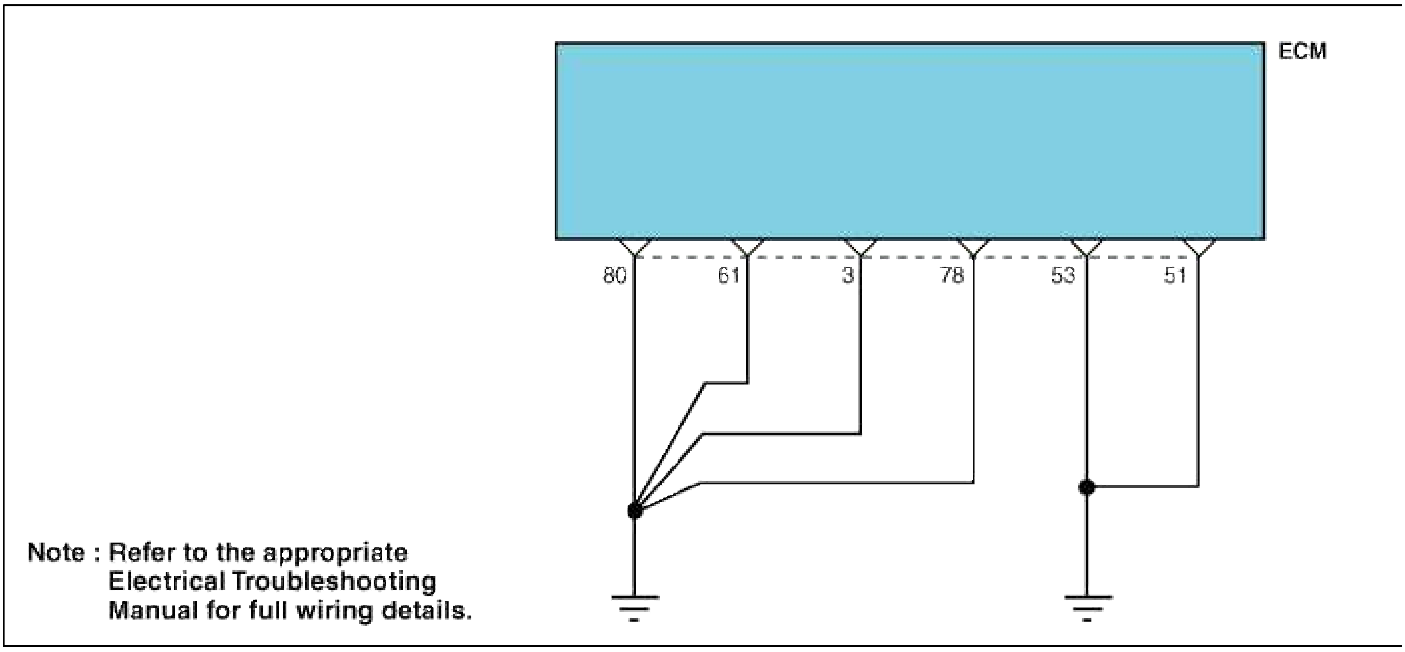
Fuel System > Engine Control System > Engine Control Module (ECM) > Troubleshooting

ENGINE CONTROL MODULE (ECM) - POWER GROUND

Check the ground condition of the engine control module.

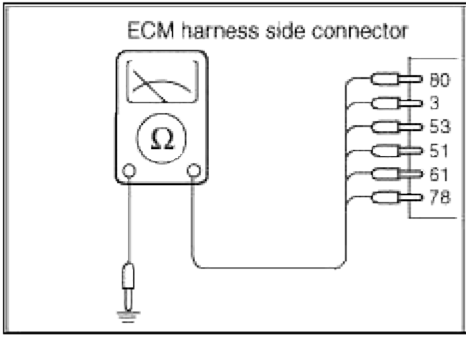


CIRCUIT DIAGRAM



Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURE



Check for continuity of the ground circuit.

- ECM connector : Disconnected

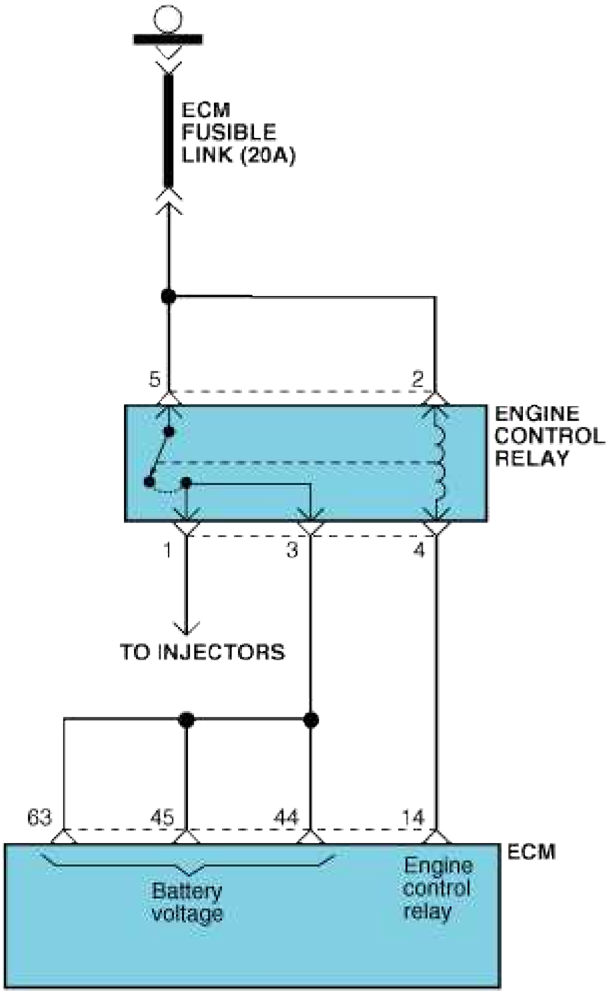
OK ⇨ **END!**

NG ⇨ Repair the harness.

MFI CONTROL RELAY

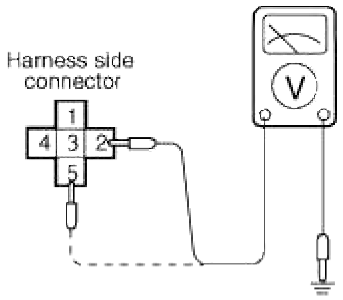
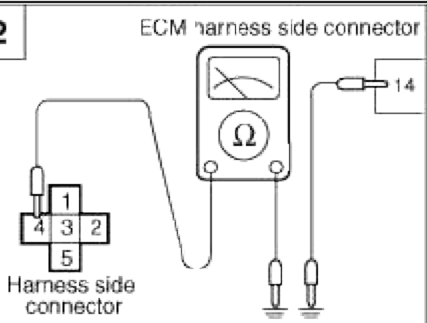
When the ignition switch is on, battery power is supplied to the ECM, the injectors, the MAP sensor, etc. While the ignition switch is turned on, current flows from the ignition switch through the current relay coil to ground.

CIRCUIT DIAGRAM


ECM FUSIBLE LINK (20A)
5
2
ENGINE CONTROL RELAY
1
3
4
TO INJECTORS
63
45
44
14
ECM
Battery voltage
Engine control relay

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURES

1  Harness side connector 1 4 3 2 5 V	Measure the power supply voltage of the MFI control relay. • MFI control relay connector : Disconnected • Voltage (V) : Battery voltage	**OK** ⇨ **NG** ⇨	**2** Repair the harness.
2  ECM harness side connector 14 Ω 1 4 3 2 5 Harness side connector	Check for open-circuit or short-circuit to ground between the engine control module and the MFI control relay. • ECM connector : Disconnected • MFI control relay : Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

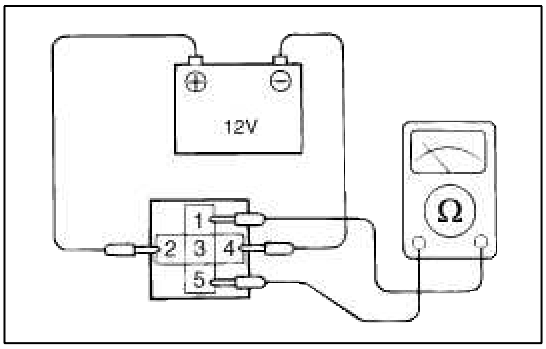
MFI CONTROL RELAY INSPECTION

1. Check continuity of relay contacts between terminals 5 (+) and 1 (-).

Relay coil (between terminal 2 & 4)	Continuity
When de-energized	No
When energized	Yes

2. If faulty, replace the MFI control relay.

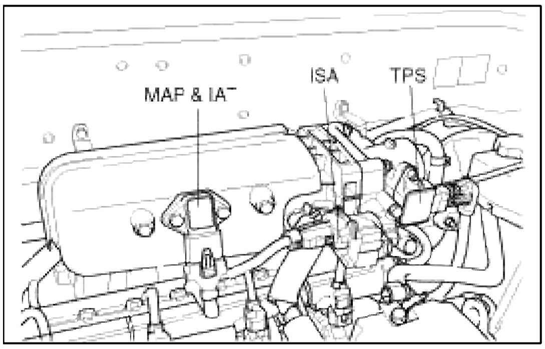
Tightening torque
MFI control relay :
7 ~ 11 Nm (70 ~ 110 kg·cm, 5.2 ~ 8.1 lb·ft)



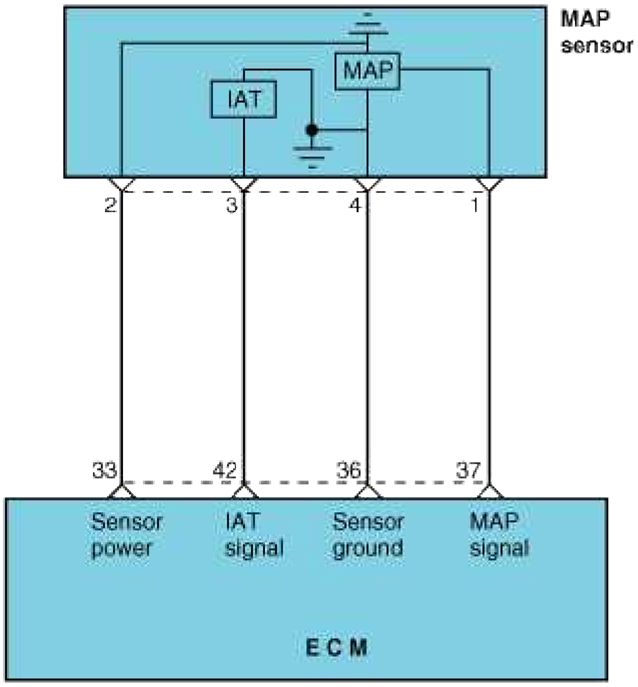
Fuel System > Engine Control System > Manifold Absolute Pressure Sensor (MAPS) > Troubleshooting

MANIFOLD ABSOLUTE PRESSURE SENSOR (MAP SENSOR)

The manifold absolute pressure (MAP) sensor is a pressure sensitive variable resistor. It measures changes in the intake manifold pressure which result from engine load and speed changes, and converts this to a voltage output. The MAP sensor is also used to measure barometric pressure at start up, and under certain conditions, allows the ECM to automatically adjust for different altitudes. The ECM supplies 5 volts to the MAP sensor and monitors the voltage on a signal line. The sensor provides a path to ground through its variable resistor. The MAP sensor input affects fuel delivery and ignition timing controls in the ECM.



CIRCUIT DIAGRAM



Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

The MIL (Malfunction Indicator Lamp) is ON or the DTC (Diagnostic Trouble Code) is displayed on the HI-SCAN under the following conditions;

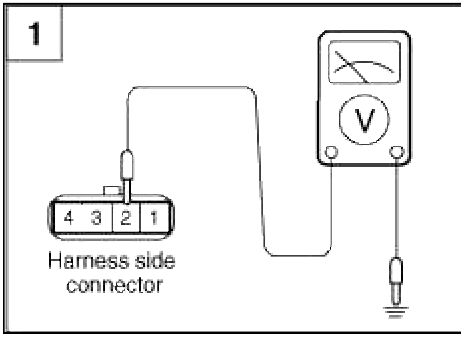
1. When the manifold pressure is 118mb or lower for 0.1 second after turning the ignition key ON.
2. When the manifold pressure is 118mb or lower while the RPM is below 1980rpm.
3. When the manifold pressure is 986mb or higher and the rpm is 2400rpm or more while the accelerator pedal is released (such as when a vehicle is moving down on a sloping road).

USING HI-SCAN

Check item	Data display	Check conditions	Engine state	Test specification
MAP sensor	Intake manifold pressure	• Engine coolant temperature : 80 to 95° (176 to 205°F) • Lamps, electric cooling fan, accessory units : ALL OFF • Transaxle : Neutral (P range for vehicle with A/T) • Steering wheel : Neutral	IG. KEY "ON"	800 ~ 1080 mb
			Idle	190 ~ 390 mb

HARNESS INSPECTION PROCEDURES

1

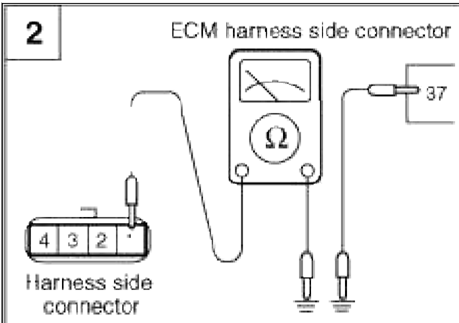
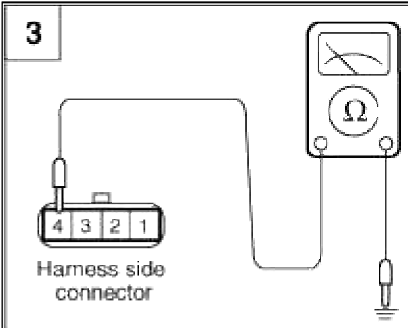


Measure the power supply voltage.

- Connector : Disconnected
- Ignition switch : ON
- Voltage (V) : 4.8 ~ 5.2V

OK ⇨ 2

NG ⇨ Repair the harness.

2	 ECM harness side connector 37 Ω 4 3 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the engine control module and MAP sensor. - MAP sensor circuit : Disconnected - Engine control module connector : Disconnected	**OK** ⇨	**3**
			NG ⇨	Repair the harness.
3		Check for continuity of the ground circuit. - Connector : Disconnected	**OK** ⇨	**END!**
			NG ⇨	Repair the harness.

SENSOR INSPECTION

1. Measure the voltage between terminals 1 and 4 of the MAP sensor connectors.
   Terminal 4 : MAP sensor ground
   Terminal 1 : MAP sensor output

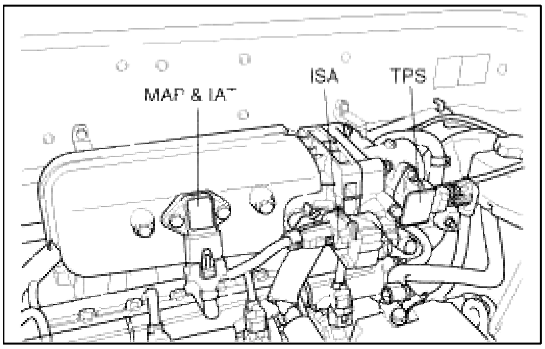
Engine state	Test specification
Ignition SW. ON.	4 ~ 5V
At idle	1.14 ± 0.4V

2. If the voltage deviates from the standard value, replace the MAP sensor assembly.

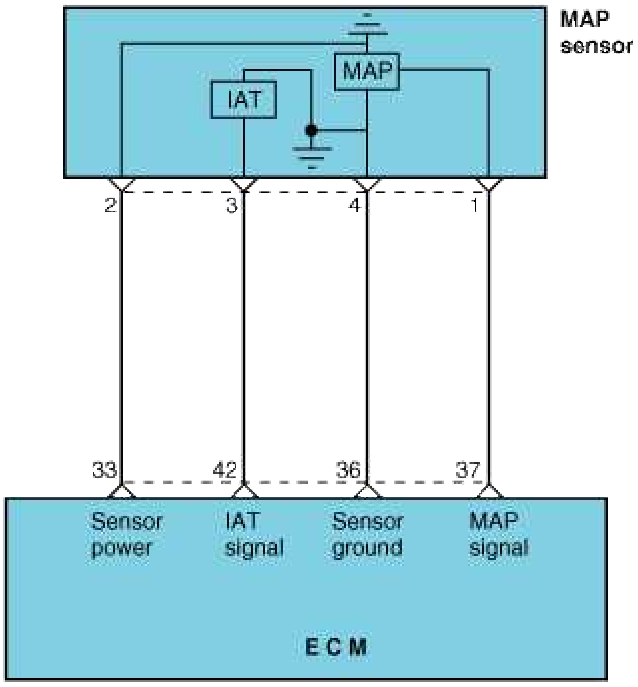
Fuel System > Engine Control System > Intake Air Temperature Sensor (IATS) > Troubleshooting

INTAKE AIR TEMPERATURE SENSOR (IAT SENSOR)

The intake air temperature sensor (IAT Sensor), built-in type in the MAP sensor, is a resistor-based sensor which detects the intake air temperature. According to the intake air temperature reading, the ECM will control the necessary amount of fuel injection.



CIRCUIT DIAGRAM


MAP sensor
MAP
IAT
2
3
4
1
33
42
36
37
Sensor power
IAT signal
Sensor ground
MAP signal
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

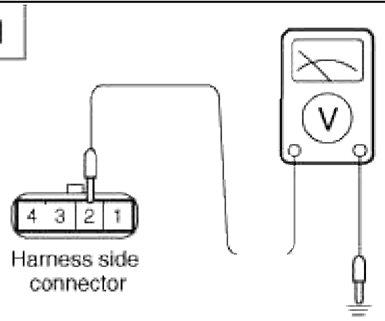
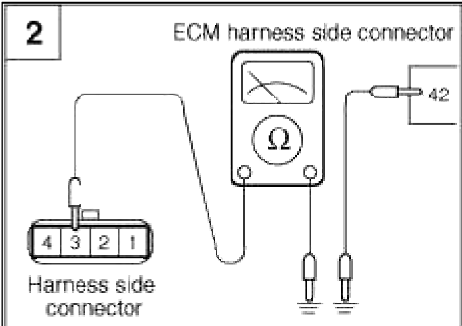
The MIL is ON or the DTC is displayed on the HI-SCAN under the following condition;

- When the intake air temperature is detected below -40°C or higher than 120°C.

USING HI-SCAN

Check item	Data display	Check conditions	Engine state	Test specification
Intake air temperature sensor	Air temperature	Ignition switch : ON or engine running	When 0°C (32°F)	4.0 ~ 4.4V
			When 20°C (68°F)	3.3 ~ 3.7V
			When 40°C (104°F)	2.5 ~ 2.9V
			When 80°C (176°F)	1.0 ~ 1.4V

HARNESS INSPECTION PROCEDURES

1  4 3 2 1 Harness side connector V	Measure the power supply voltage of the IAT Sensor. • Connector : Disconnected • Ignition switch : ON • Voltage : 4.8 ~ 5.2V	OK ⇨ NG ⇨	2 Repair the harness.
2  ECM harness side connector 42 Ω 4 3 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the engine control module and the IAT sensor. • ECM connector : Disconnected • IAT sensor connector : Disconnected	OK ⇨ NG ⇨	END! Repair the harness.

SENSOR INSPECTION

1. Using a multimeter, measure the IAT sensor resistance between terminals 3 and 4.

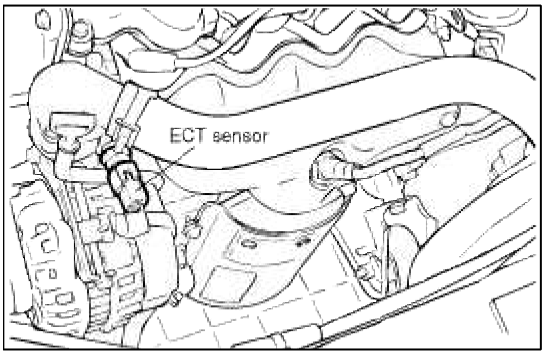
IG. SW. ON	**Temperature °C (°F)**	**Resistance (kΩ)**
	0 (32)	4.5 ~ 7.5
	20 (68)	2.0 ~ 3.0
	40 (104)	0.7 ~ 1.6
	80 (176)	0.2 ~ 0.4

2. If the resistance deviates from the standard value, replace the intake air temperature sensor assembly.

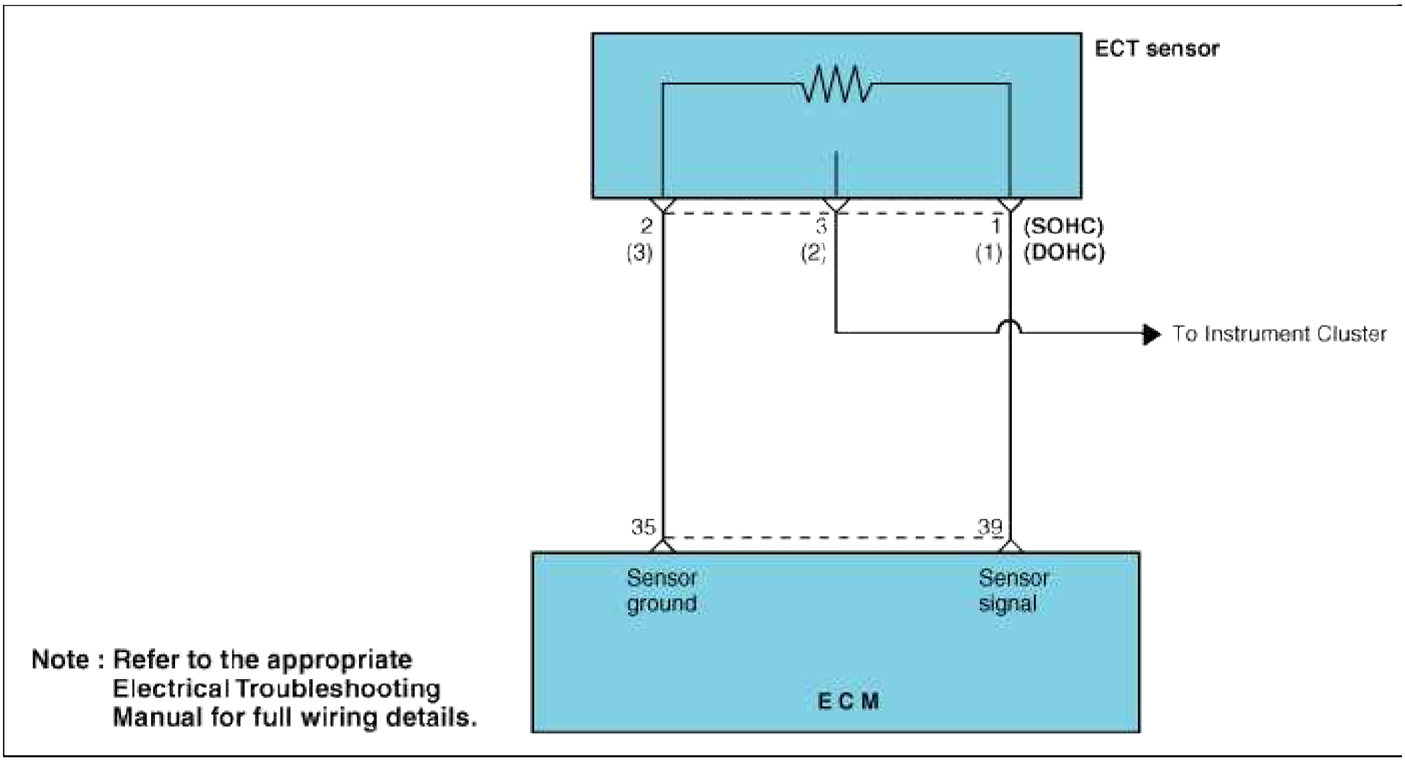
Fuel System > Engine Control System > Engine Coolant Temperature Sensor (ECTS) > Troubleshooting

ENGINE COOLANT TEMPERATURE SENSOR (ECT SENSOR)

The engine coolant temperature sensor is located in the engine coolant passage of the cylinder head. It detects the engine coolant temperature and relays signals to the ECM. It employs a thermistor which is sensitive to changes in temperature. The electric resistance of a thermistor decreases in response to temperature increase. The ECM judges engine coolant temperature by the sensor output voltage and provides optimum fuel enrichment when the engine is cold.



CIRCUIT DIAGRAM

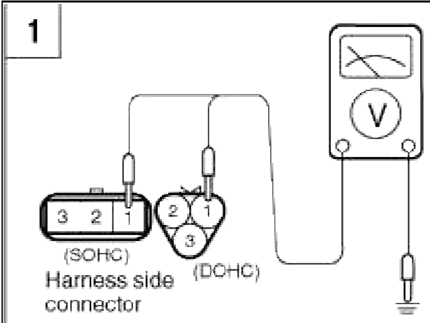

ECT sensor
2
(3)
3
(2)
1
(1)
(SOHC)
(DOHC)
To Instrument Cluster
35
39
Sensor ground
Sensor signal
E C M
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

USING HI-SCAN

Check item	Data display	Check conditions	Engine state	Test specification
Engine coolant temperature sensor	Sensor temperature	Ignition switch : ON or engine running	When 0°C (32°F)	4.27V ± 0.3
			When 20°C (68°F)	3.44V ± 0.3
			When 40°C (104°F)	2.72V ± 0.3
			When 80°C (176°F)	1.25V ± 0.3

HARNESS INSPECTION PROCEDURES

1


V
3
2
1
2
1
3
(SOHC)
Harness side connector
(DOHC)

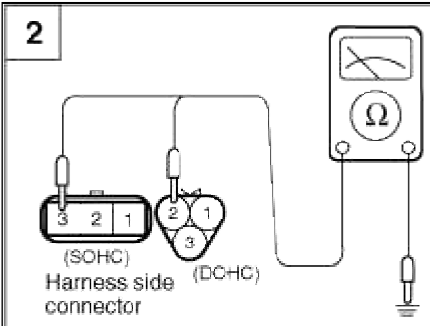
Measure the power supply voltage.

- Connector : Disconnected
- Ignition switch : ON
- Voltage : 4.8 ~ 5.2V

OK ⇨ **2**

NG ⇨ Repair the harness.

2


Ω
3
2
1
2
1
3
(SOHC)
Harness side connector
(DOHC)

Check for continuity of the ground circuit.

- Connector : Disconnected

OK ⇨ **END!**

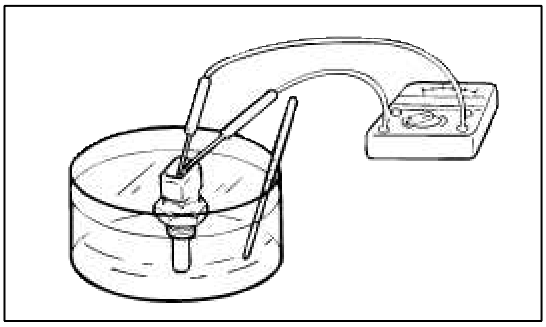
NG ⇨ Repair the harness.

SENSOR INSPECTION

1. Remove the engine coolant temperature sensor from the intake manifold.

2. With the temperature sensing portion of the engine coolant temperature sensor immersed in hot water, check resistance.

Temperature °C (°F)	Resistance (kΩ)
-30 (-22)	22.22 ~ 31.78
-10 (14	8.16 ~ 10.74
0 (32)	5.18 ~ 6.60
20 (68)	2.27 ~ 2.73
40 (104)	1.059 ~ 1.281
60 (140)	0.538 ~ 0.650
80 (176)	0.298 ~ 0.322
90 (194)	0.219 ~ 0.243



3. If the resistance greatly deviates from the standard value, replace the sensor.

INSTALLATION

1. Apply sealant LOCTITE 962T or equivalent to threaded portion.
2. Install engine coolant temperature sensor and tighten it to specified torque.

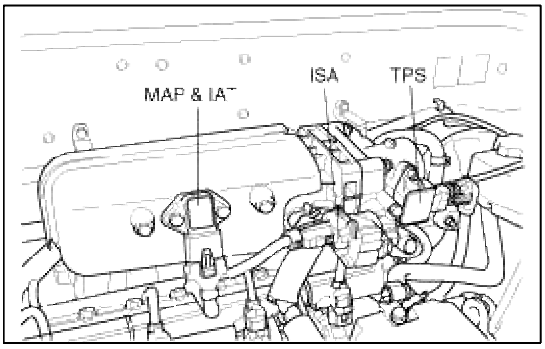
Tightening torque
Engine coolant temperature sensor
SOHC: 15~20 Nm (150~200 kg·cm, 11~15 lb·ft)
DOHC: 25~30 Nm (250~300 kg·cm, 18~22 lb·ft)

3. Connect the harness connector securely.

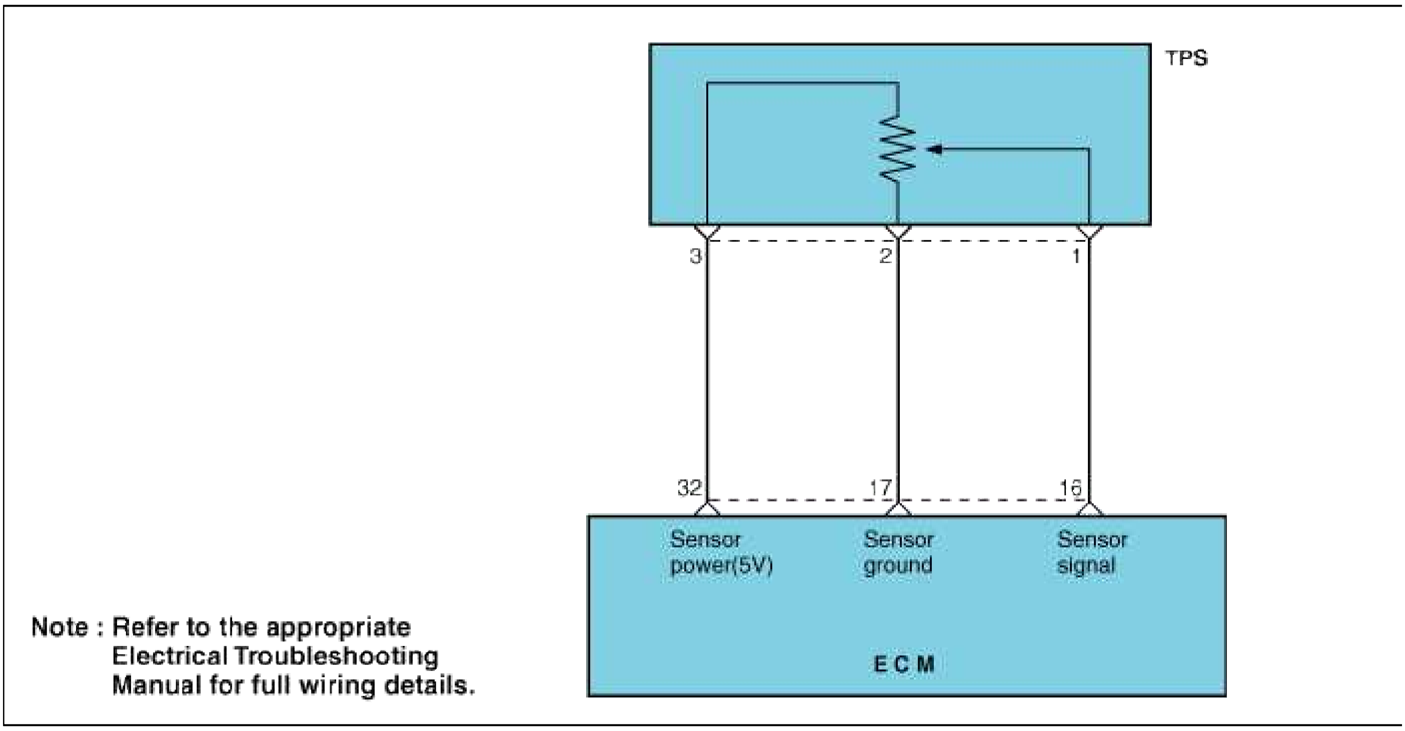
Fuel System > Engine Control System > Throttle Position Sensor (TPS) > Troubleshooting

THROTTLE POSITION SENSOR (TPS)

The TP Sensor is a rotating type variable resistor that rotates with the throttle body's throttle shaft to sense the throttle valve angle. As the throttle shaft rotates, the throttle angle of the TP Sensor changes and the ECM detects the throttle valve opening based on the TPS output voltage.



CIRCUIT DIAGRAM



Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

1. The TPS signal is important for the control of the automatic transaxle. Shift shock and other trouble may occur if the sensor is faulty.
2. If the idle condition or acceleration is abnormal, check the TPS connector. (When the TPS connector is not connected properly, the current data on HI-SCAN can show that the idle state remains off, although the accelerater pedal is released. This results in the improper idle or acceleration.)
3. Input voltage from throttle position sensor is below 0.1V or above 4.7V when ignition switch is turned on.

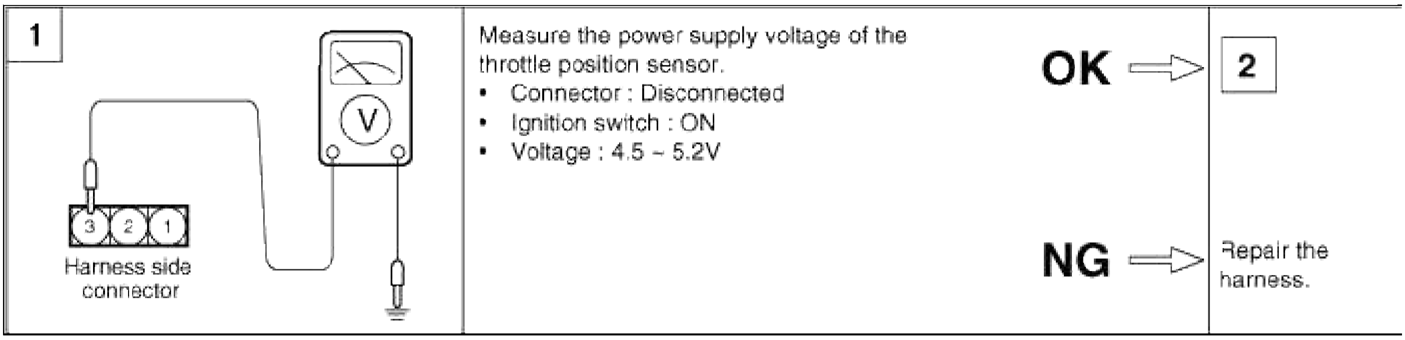
USING HI-SCAN

Check item	Data display	Check condition	Test specification
Throttle position sensor	Throttle angle	At idle rpm	5° ~ 16°
		Gradually open	Increases
		Wide open throttle	80° ~ 98°

USING VOLTMETER

Check item	Check condition	Test specification
Throttle position sensor output voltage (TP Sensor side connector No.1 or ECM harness side connector No.16)	At idle rpm	0.3 ~ 0.9V
	Wide open throttle	4.5 ~ 5.2V

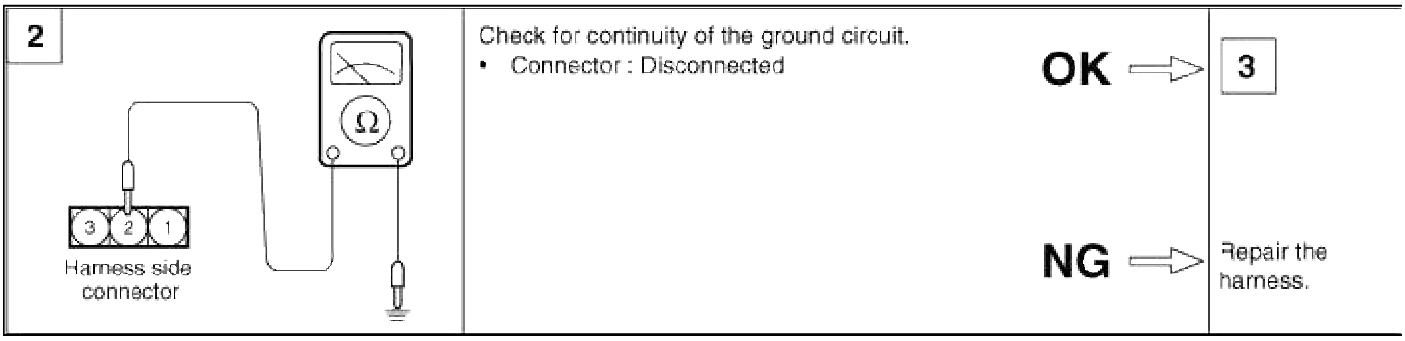
HARNESS INSPECTION PROCEDURES



Measure the power supply voltage of the throttle position sensor.
- Connector : Disconnected
- Ignition switch : ON
- Voltage : 4.5 ~ 5.2V

OK → 2

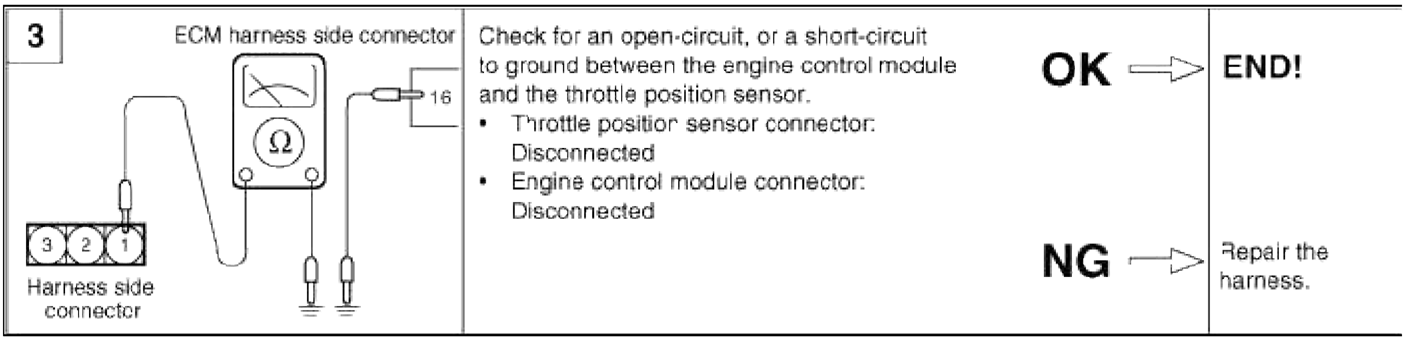
NG → Repair the harness.



Check for continuity of the ground circuit.
- Connector : Disconnected

OK → 3

NG → Repair the harness.



Check for an open-circuit, or a short-circuit to ground between the engine control module and the throttle position sensor.
- Throttle position sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → END!

NG → Repair the harness.

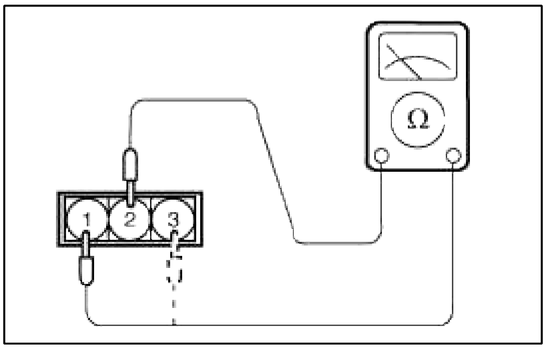
SENSOR INSPECTION

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between terminals 2 (sensor ground) and terminal 3 (sensor power).

0.7 ~ 3.0 kΩ

3. Connect an analog ohmmeter between terminals 2 (sensor ground) and terminal 1 (sensor output).
4. Operate the throttle valve slowly from the idle position to the full open position, and check that the resistance changes smoothly in proportion with the throttle valve opening angle.
5. If the resistance is out of specification, or fails to change smoothly, replace the throttle position sensor.

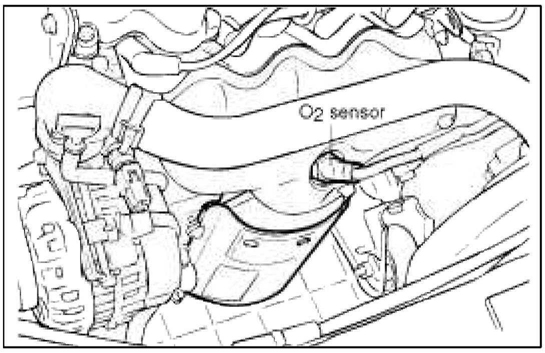
Tightening torque
Throttle position sensor :
1.5 ~ 2.5 Nm (15 ~ 25 kg·cm, 1.1 ~ 1.8 lb·ft)



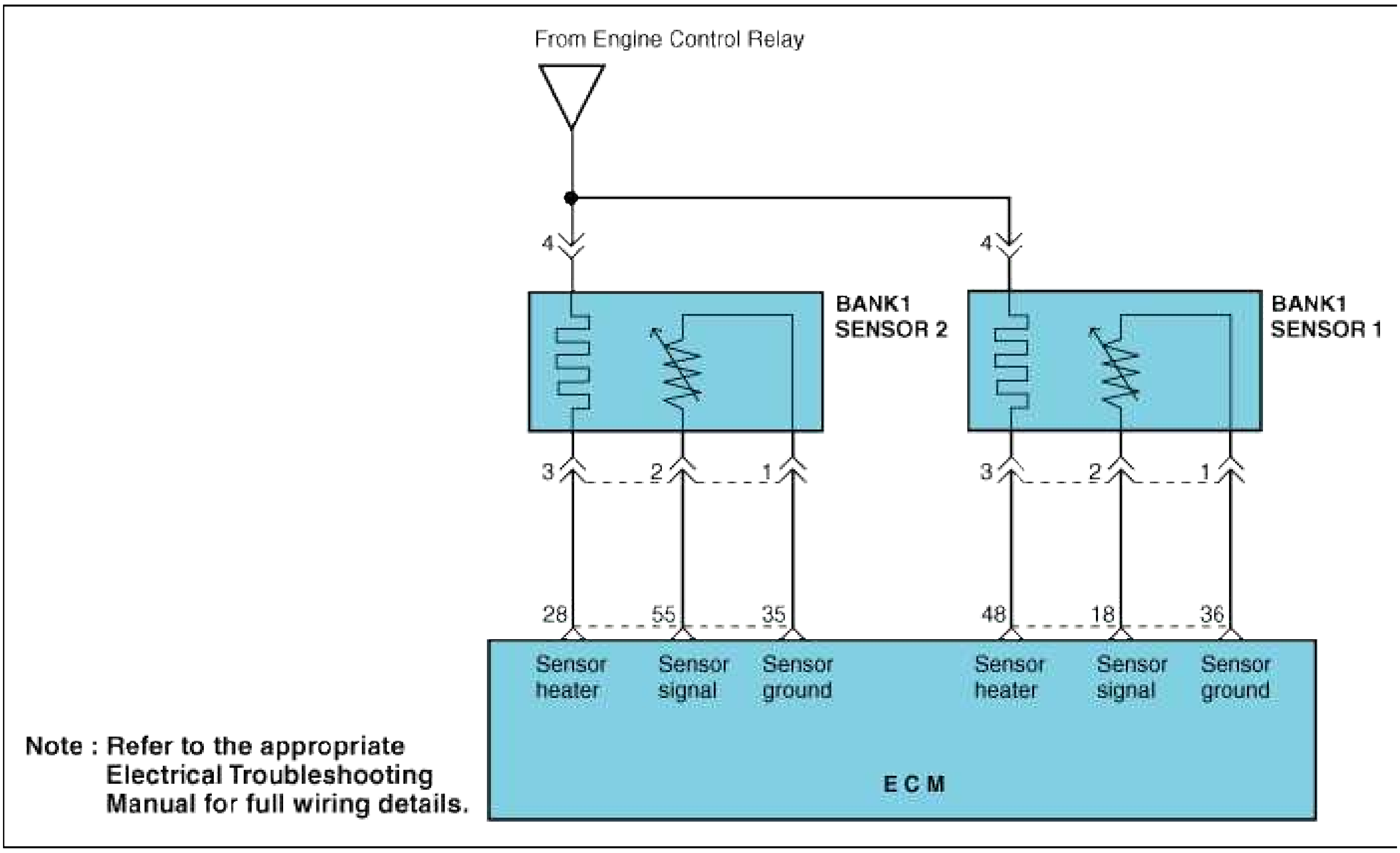
Fuel System > Engine Control System > Heated Oxygen Sensor (HO2S) > Troubleshooting

HEATED OXYGEN SENSOR (HO2S)

The heated oxygen sensor senses the oxygen concentration in the exhaust gas, then converts it into a voltage and then sends this to the ECM. The heated oxygen sensor gives an output of about 800mV when the air fuel ratio is richer than the theoretical ratio and output of about 100mV when the ratio is leaner (higher oxygen concentration in exhaust gas.) The ECM controls fuel injection based on this signal so that the air fuel ratio is maintained at the theoretical ratio.



CIRCUIT DIAGRAM


From Engine Control Relay
4
4
BANK1 SENSOR 2
BANK1 SENSOR 1
3
2
1
3
2
1
28
55
35
48
18
36
Sensor heater
Sensor signal
Sensor ground
Sensor heater
Sensor signal
Sensor ground
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

1. If the heated oxygen sensor is defective, abnormally high emissions may occur.
2. If the heated oxygen sensor check is normal but the sensor output voltage is out of specification, check for the following items related to the air fuel ratio control system :

- Faulty injector.
- Air leaks in the intake manifold.
- Faulty mass air flow sensor, purge valve and engine coolant temperature sensor.
- Wiring connection problem.

USING VOLTMETER/HI-SCAN

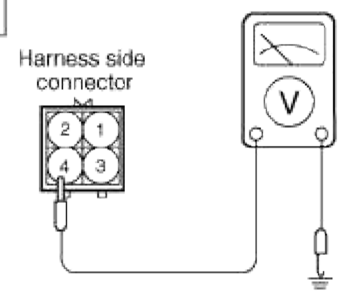
Check item	Check condition	Engine condition	Test specification
Heated oxygen sensor output voltage	Warm-up	When decelerating suddenly from 4000 rpm	A. 200mV or lower
		When engine is suddenly raced	B. 600 ~ 1000mV

NOTE

If you release the accelerator pedal suddenly after engine running about 4000 rpm, fuel supply will stop for short period and the O sensor service data in the HI-SCAN will display values in the A range.
When you suddenly press on the acclerator pedal down, the voltage will reach B range.
When you let the engine idle again, the voltage will fluctuate between ranges A and B. In this case, the O sensor can be determined as good.

HARNESS INSPECTION PROCEDURES

1



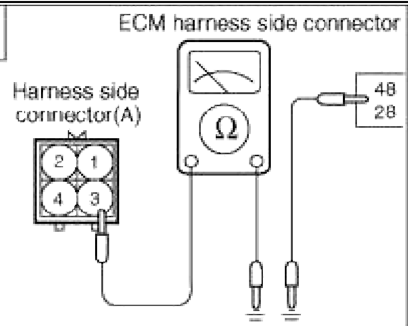
Measure the power supply voltage of the heated oxygen sensor.

- Connector : Disconnected
- Ignition switch : ON
- Voltage (V) : Battery voltage

OK ⇨ 2

NG ⇨ Repair the harness.

2



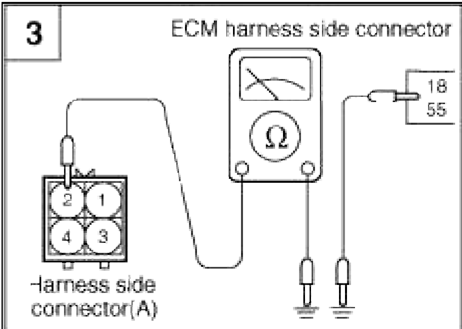
Check for an open-circuit, or a short-circuit to ground between the engine control module and the heated oxygen sensor.

- Heated oxygen sensor connector: Disconnected
- ECM connector : Disconnected

OK ⇨ 3

NG ⇨ Repair the harness.
(B1/S1)
A3 - ECM:48
(B1/S2)
A3 - ECM:28

3

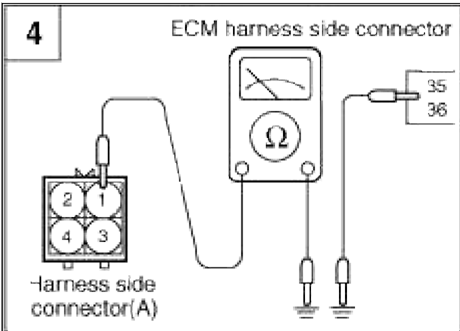


Check for an open-circuit, or a short-circuit to ground between the engine control module and the heated oxygen sensor.

- Heated oxygen sensor connector: Disconnected
- ECM connector : Disconnected

OK ⇨ 4

NG ⇨ Repair the harness.
(B1/S1)
A2 - ECM:18
(B1/S2)
A2 - ECM:55

4	 ECM harness side connector 35 36 Ω 2 1 4 3 Harness side connector(A)	Check for continuity to ground circuit. • Connector : Disconnected	**OK**	**END!**
			NG	Repair the harness. (B1/S1) A1 - ECM:36 (B1/S2) A1 - ECM:35

SENSOR INSPECTION

NOTE

1. Before checking, warm up the engine until the engine coolant temperature reaches 80 to 95°C (176 to 205°F).
2. Use an accurate digital voltmeter.

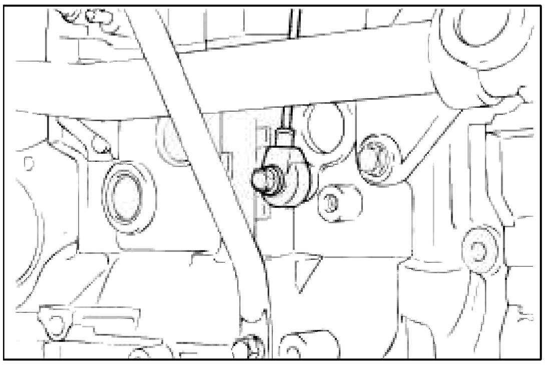
Replace the oxygen sensor if there is a malfunction

Tightening torque
Heated oxygen sensor :
50 ~ 60 Nm (500 ~ 600 kg·cm, 37 ~ 44 lb·ft)

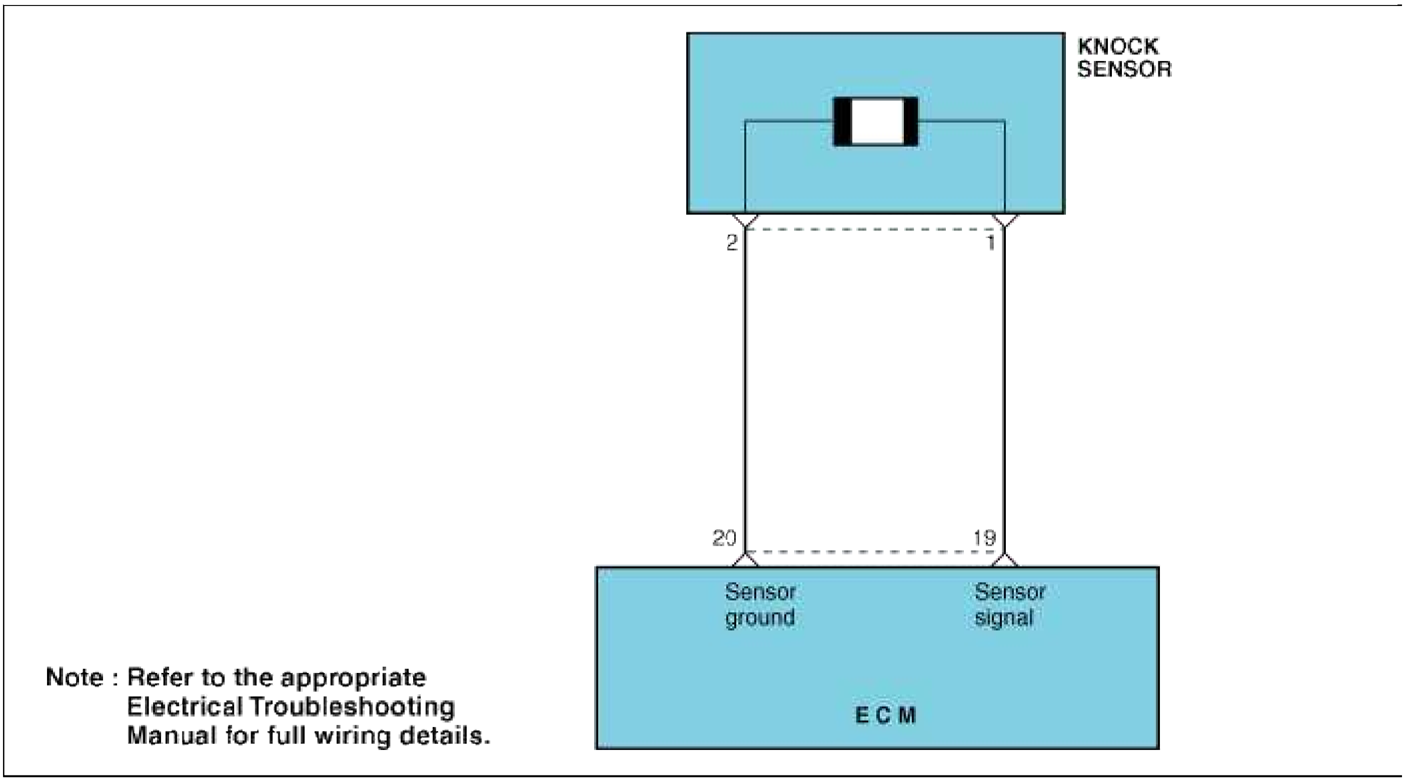
Fuel System > Engine Control System > Knock Sensor (KS) > Troubleshooting

KNOCK SENSOR

The knock sensor is attached to the side of the cylinder block to sense engine knocking. A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is relayed to the ECM. If engine knocking occurs, ignition timing is retarded to suppress it.



CIRCUIT DIAGRAM


KNOCK SENSOR
2
1
20
19
Sensor ground
Sensor signal
ECM
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURE

SENSOR INSPECTION

1. Disconnect the knock sensor connector and measure resistance between terminals 1 and 2.

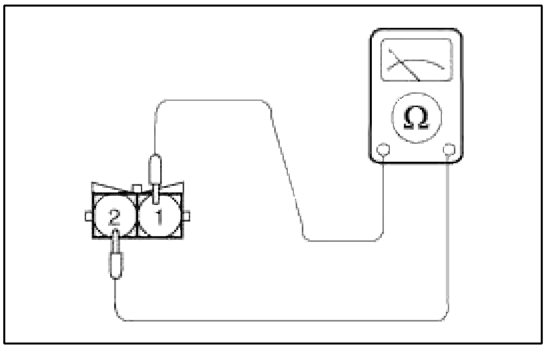
about 5MΩ [at 20°C (68°F)]

2. If the resistance is continuous, replace the knock sensor.

Tightening torque
Knock sensor :
16 ~ 25 Nm (160 ~ 250 kg·cm, 12 ~ 18 lb·ft)

3. Measure the capacitance between terminals 1 and 2.

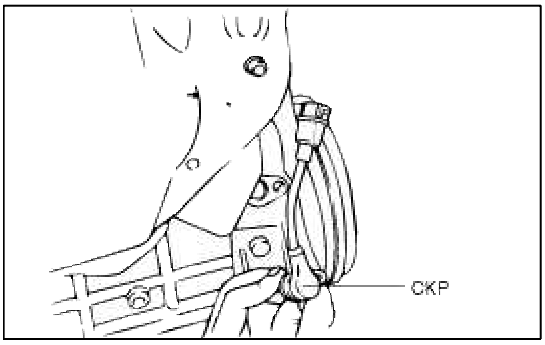
800 ~ 1600 pF



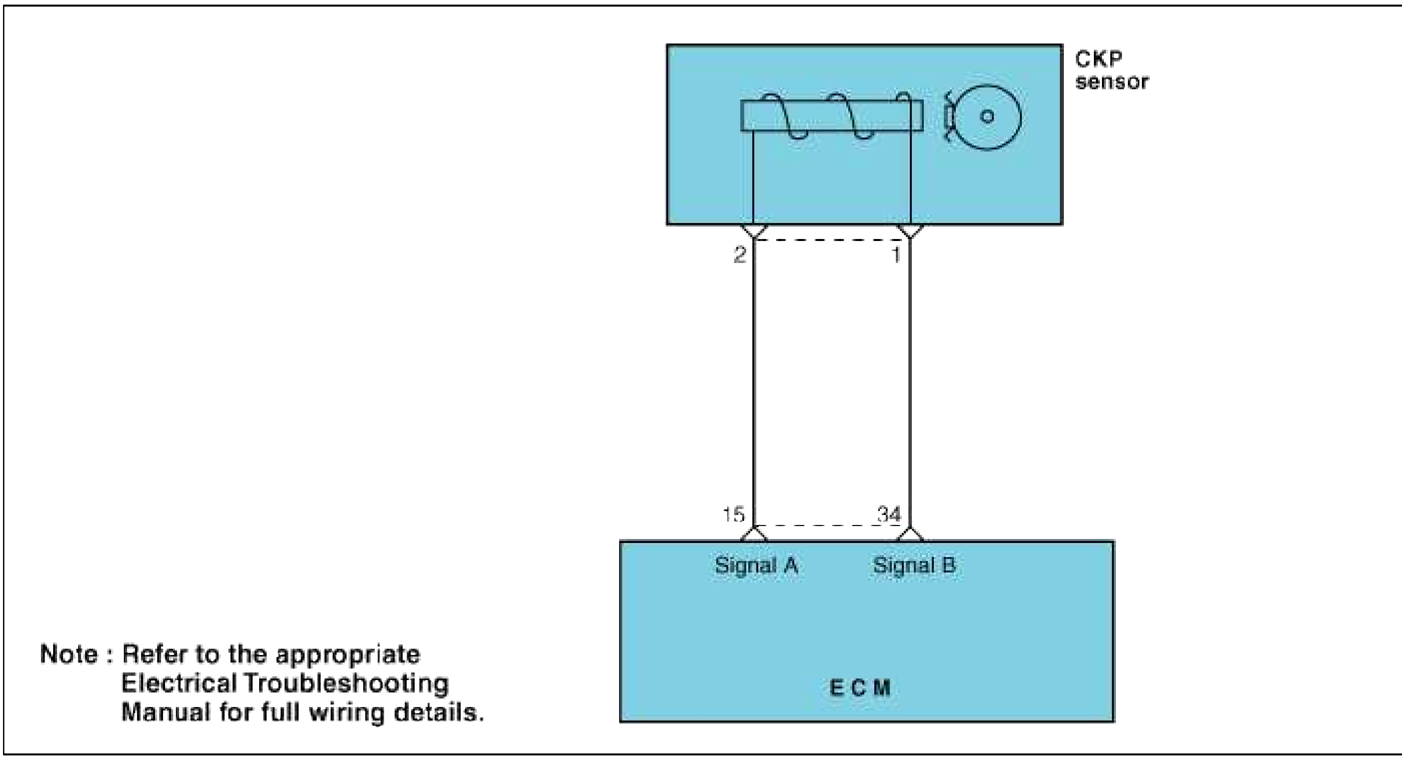
Fuel System > Engine Control System > Crankshaft Position Sensor (CKPS) > Troubleshooting

CRANKSHAFT POSITION SENSOR (CKP SENSOR)

The crankshaft position sensor, consisted of a magnet and coil, is located next to flywheel. The voltage signal from this crankshaft position sensor is relayed to the ECM to indicate engine RPM and the position of the crankshaft.

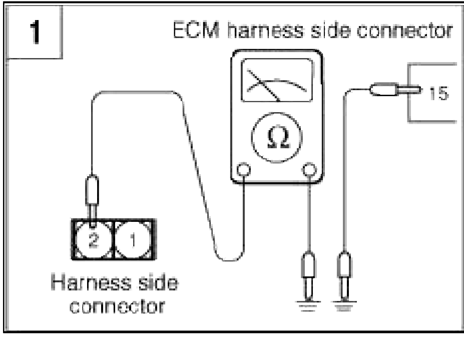


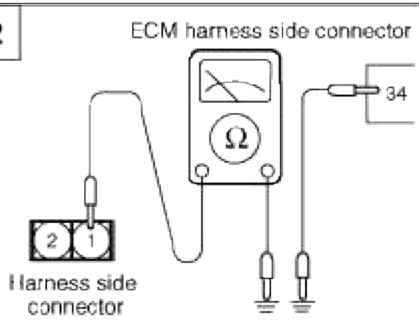
CIRCUIT DIAGRAM


CKP sensor
2
1
15
34
Signal A
Signal B
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURES

1  ECM harness side connector 15 Ω 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the ECM and the crankshaft position sensor. • ECM connector : Disconnected • Crankshaft position sensor connector: Disconnected	**OK** ⇨	2
		NG ⇨	Repair the harness.

2	 ECM harness side connector 34 Ω 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the ECM and the crankshaft position sensor. • ECM connector : Disconnected • Crankshaft position sensor connector: Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

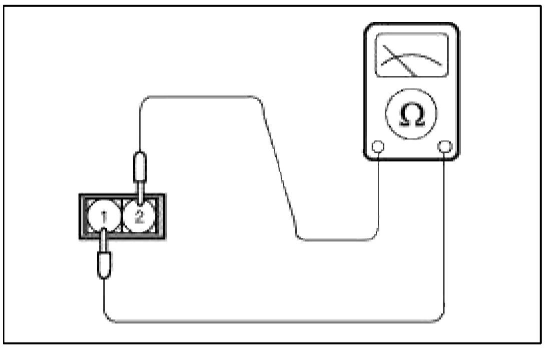
SENSOR INSPECTION

1. Disconnect the crankshaft position sensor connector.
2. Measure the resistance between terminals 1 and 2.

0.486 ~ 0.594kΩ at 20°C (68°F)

3. If the resistance deviates greatly from the standard value, replace the sensor.

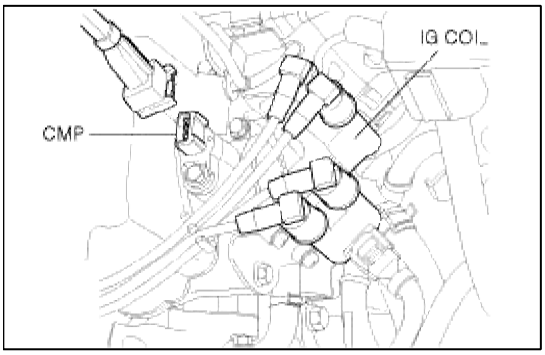
- **Standard value**
  Clearance between the crankshaft position sensor and crankshaft position sensor wheel :
  0.5 ~ 1.5 mm (0.020 ~ 0.059 in.)
- **Tightening torque**
  Crankshaft position sensor :
  9 ~ 11 Nm (90 ~ 110 kg·cm, 7 ~ 8 lb·ft)



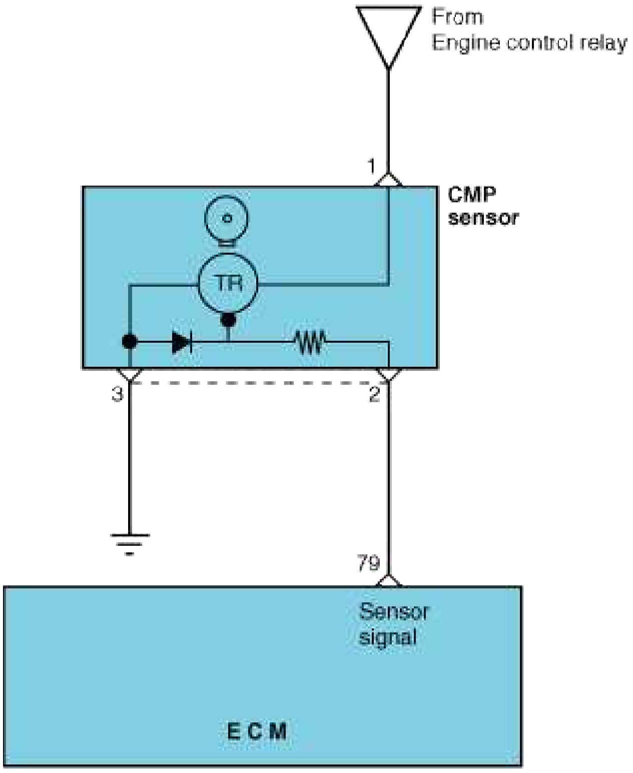
Fuel System > Engine Control System > Camshaft Position Sensor (CMPS) > Troubleshooting

CAMSHAFT POSITION SENSOR (CMP SENSOR)

The camshaft position sensor (CMP Sensor) senses the TDC point of No.1 cylinder on its compression stroke. Its signal is fed to the ECM to be used to determine the sequence of fuel injection.



CIRCUIT DIAGRAM


From
Engine control relay
1
CMP
sensor
TR
3
2
79
Sensor
signal
E C M

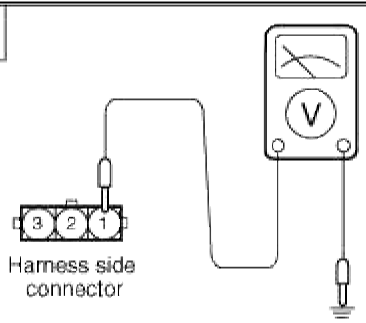
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

USING VOLTMETER

Check item	Check condition	Test specification
Camshaft position sensor output voltage	At idle rpm	0 ~ 5V (5 ~ 8 Hz)
	3000 rpm	0 ~ 5V (24 ~ 26 Hz)

HARNESS INSPECTION PROCEDURES

1


3 2 1
V
Harness side
connector

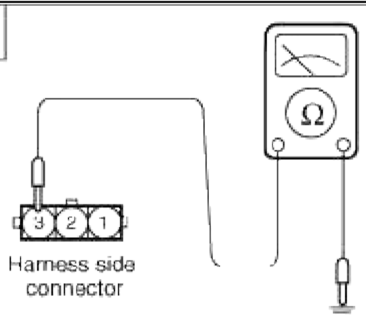
Measure the power supply voltage.

- Connector : Disconnected
- Ignition switch : ON
- Voltage (V) : Battery voltage

OK ⇨ **2**

NG ⇨ Repair the harness.

2

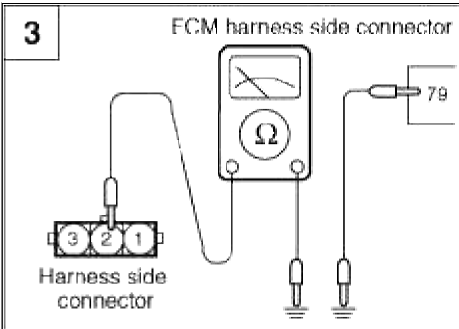

3 2 1
Ω
Harness side
connector

Check for continuity of the ground circuit.

- Connector : Disconnected

OK ⇨ **3**

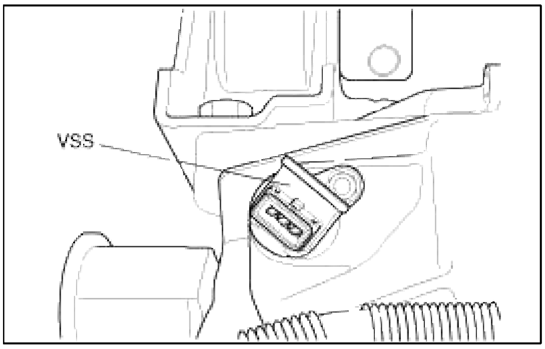
NG ⇨ Repair the harness.

3	 ECM harness side connector 79 Ω 3 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the engine control module and the camshaft position sensor. • Camshaft position sensor connector: Disconnected • Engine control module connector: Disconnected	**OK** ⇒	**END!**
			NG ⇒	Repair the harness.

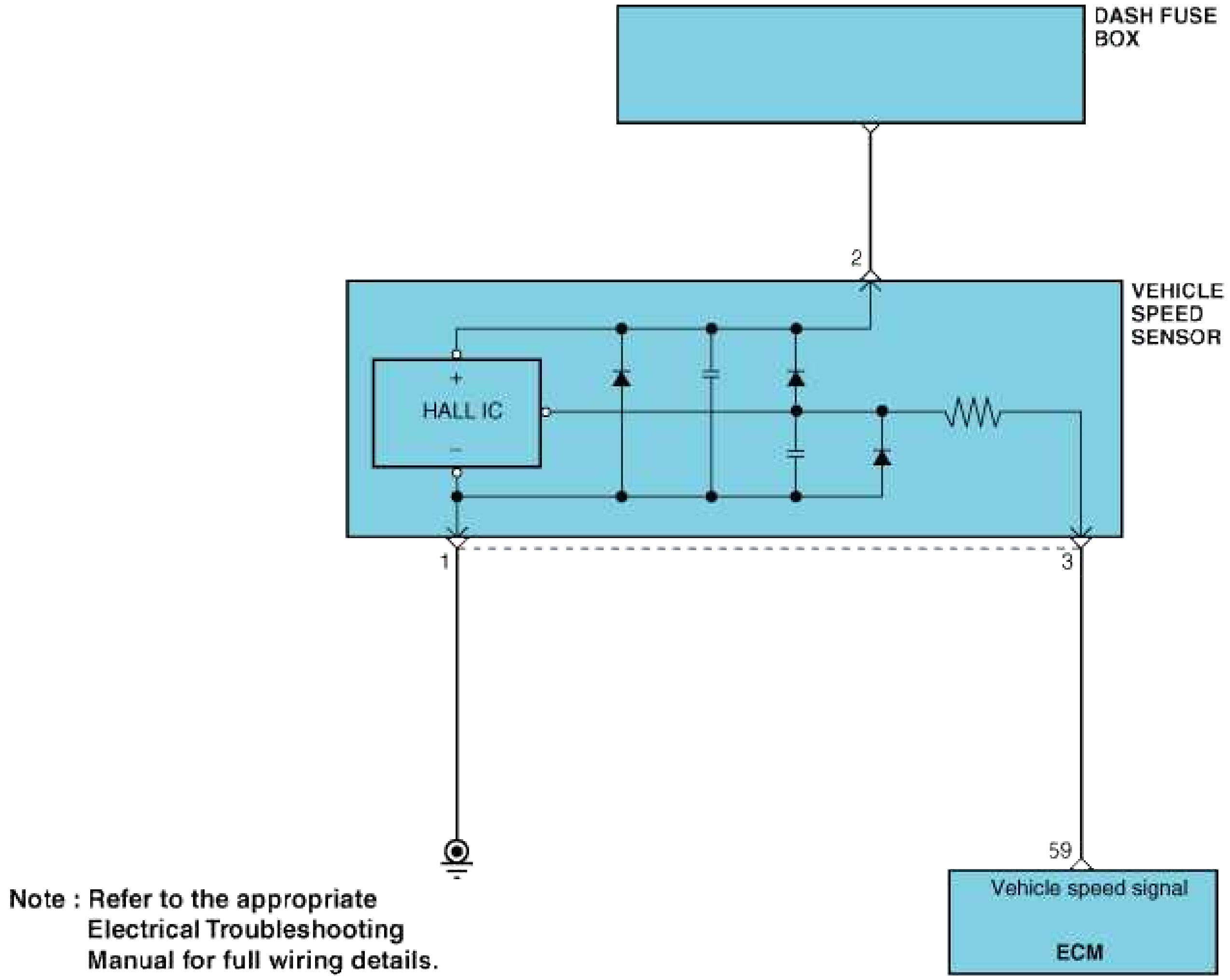
Fuel System > Engine Control System > Vehicle Speed Sensor (VSS) > Troubleshooting

VEHICLE SPEED SENSOR

The vehicle speed sensor is a hall effect sensor that is attached on the output shaft of transaxle. The sensor converts the transaxle gear revolutions into a pulse signal which is sent to the ECM.



CIRCUIT DIAGRAM

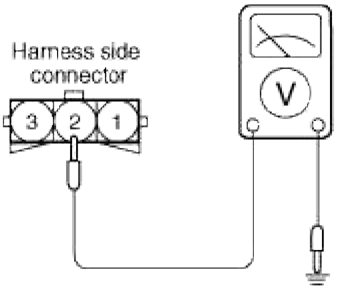

DASH FUSE BOX
2
VEHICLE SPEED SENSOR
+
HALL IC
–
1
3
59
Vehicle speed signal
ECM

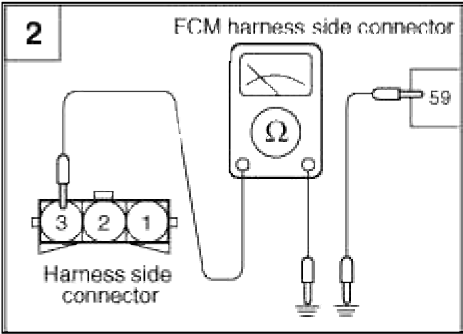
Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

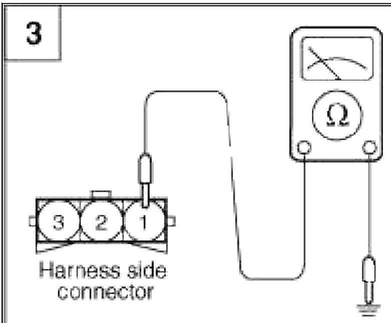
TROUBLESHOOTING HINTS

If there is an open or short circuit in the vehicle speed sensor signal circuit,the engine may stall when the vehicle decelerates to a stop.

HARNESS INSPECTION PROCEDURES

1  Harness side connector 3 2 1 V	Measure the power supply voltage of the VSS. • Connector : Disconnected • Ignition switch : ON • Voltage (V) : Battery voltage	**OK** ⇒ **NG** ⇒	**2** Repair the harness.

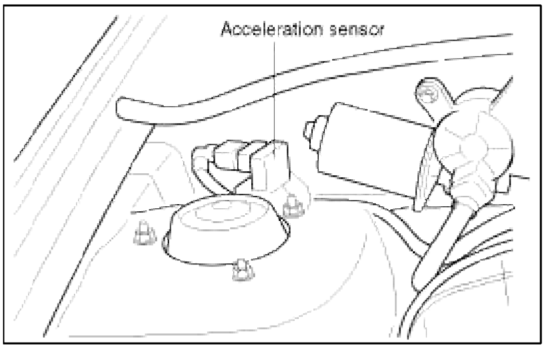
2  ECM harness side connector 59 Ω 3 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the ECM and the VSS. • ECM connector : Disconnected • VSS connector : Disconnected	**OK** ⇒ **NG** ⇒	**3** Repair the harness.

3  Ω 3 2 1 Harness side connector	Check for an open-circuit between VSS and ground. • VSS connector : Disconnected	**OK** ⇨	**END!**
		NG ⇨	Repair the harness.

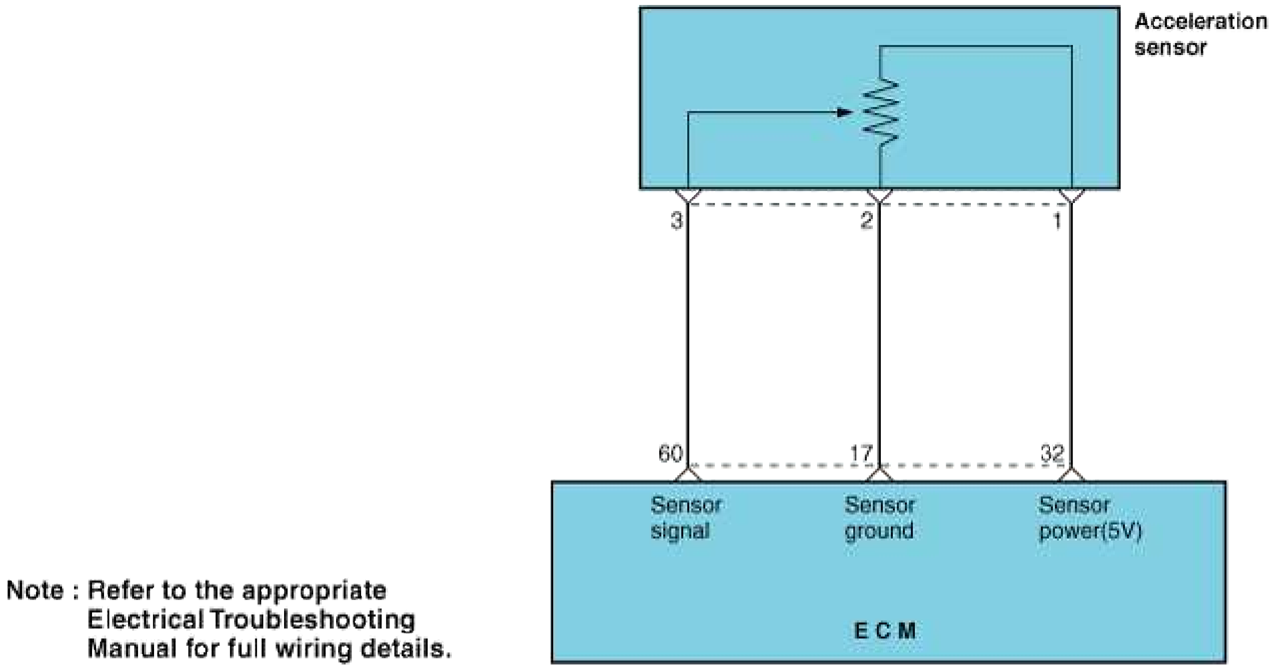
Fuel System > Engine Control System > Acceleration Sensor > Troubleshooting

ACCELERATION SENSOR

The acceleration sensor is used to sense rough road conditions. The sensor's signal is used by the Engine Control Module (ECM) to prevent wrongful misfire detection.


Acceleration sensor

CIRCUIT DIAGRAM

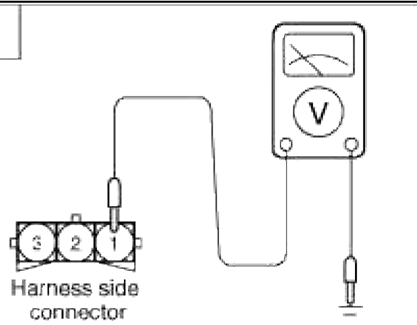
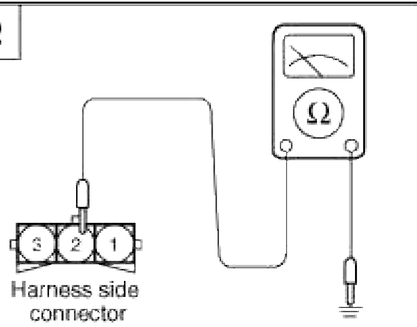
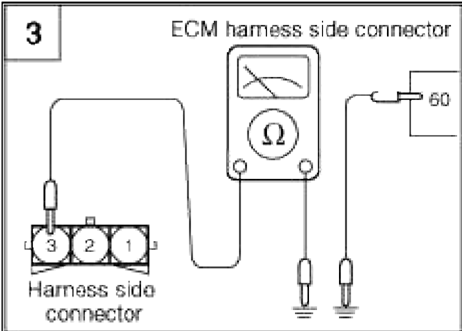

Acceleration sensor
3
2
1
60
17
32
Sensor signal
Sensor ground
Sensor power(5V)
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

USING VOLTMETER

Check item	Check condition	Test specification
Acceleration sensor output voltage	While idling	2.3 ~ 2.7V
	IG. OFF	0V

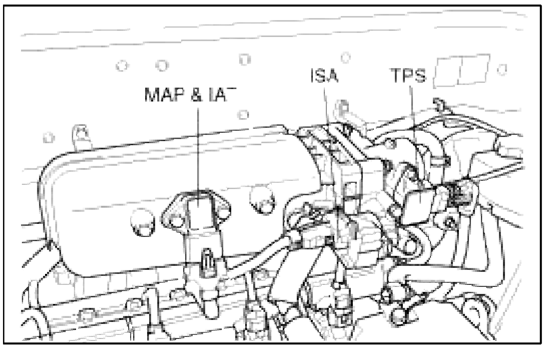
HARNESS INSPECTION PROCEDURES

1	 V 3 2 1 Harness side connector	Measure the sensor voltage(5V) of the acceleration sensor. o Sensor connector : Disconnected o ECM connector : Connected	**OK** ⇒ **NG** ⇒	**2** Repair the harness.
2	 Ω 3 2 1 Harness side connector	Check for continuity of the ground circuit. • Connector : Disconnected	**OK** ⇒ **NG** ⇒	**3** Repair the harness.
3	 ECM harness side connector Ω 60 3 2 1 Harness side connector	Check for an open-circuit, or a short-circuit to ground between the ECM and the acceleration sensor. • Acceleration sensor connector : Disconnected • Engine control module connector Disconnected	**OK** ⇒ **NG** ⇒	**END!** Repair the harness.

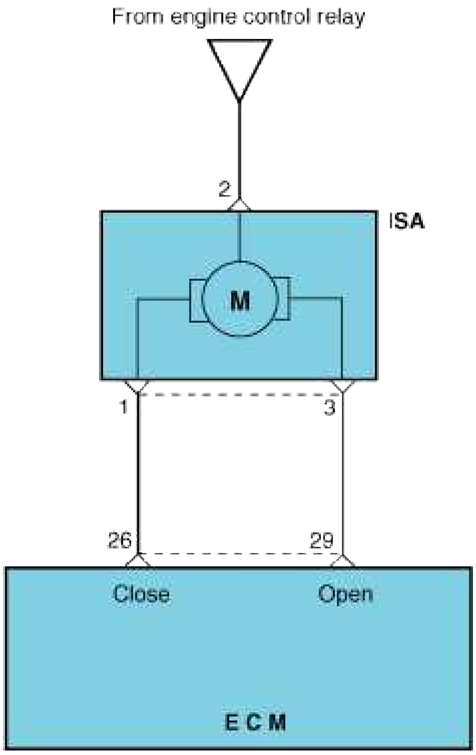
Fuel System > Engine Control System > Idle Speed Control Actuator (InodeA) > Troubleshooting

IDLE SPEED CONTROL ACTUATOR (ISC ACTUATOR)

The idle speed actuator is a double coil type driven by separate driver stages in the ECM. Depending on the pulse duty factor, the equilibrium of the magnetic forces of the two coils will result in different angles of the motor. A bypass hose line is positioned, in parallel to the throttle valve where the idle speed actuator is inserted.


MAP & IAT
ISA
TPS

CIRCUIT DIAGRAM


From engine control relay
2
ISA
M
1
3
26
29
Close
Open
E C M

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

TROUBLESHOOTING HINTS

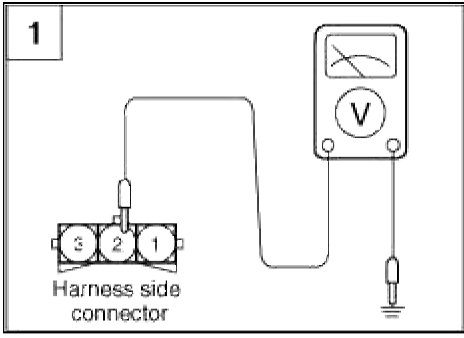
Open or short circuit is observed in idle air control system when ignition switch is turned on.

USING HI-SCAN

Check item	Check condition	Engine condition	Test specification
Idle speed control actuator • Actuator test	Start the engine	ISCV	Activate

HARNESS INSPECTION PROCEDURES

1

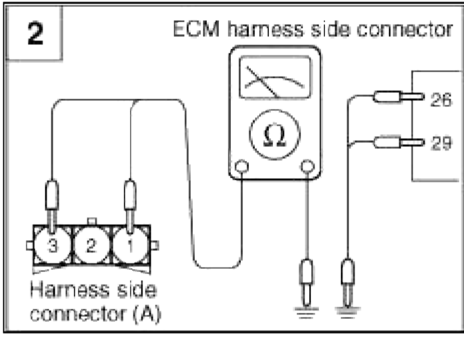

V
3
2
1
Harness side connector

Measure the power supply voltage of the injector.
- Connector : Disconnected
- Ignition switch : ON
- Voltage (V) : Battery voltage

OK ⇨ 2

NG ⇨ Repair the harness.

2


ECM harness side connector
Ω
26
29
3
2
1
Harness side connector (A)

Check for an open-circuit, or a short-circuit to ground between the ECM and the idle speed control actuator.
- ECM connector : Disconnected
- Idle speed actuator connector: Disconnected

OK ⇨ **END!**

NG ⇨ Repair the harness.
A1 - ECM:26
A3 - ECM:29

ACTUATOR INSPECTION

RESISTANCE MEASUREMENT BETWEEN TERMINALS

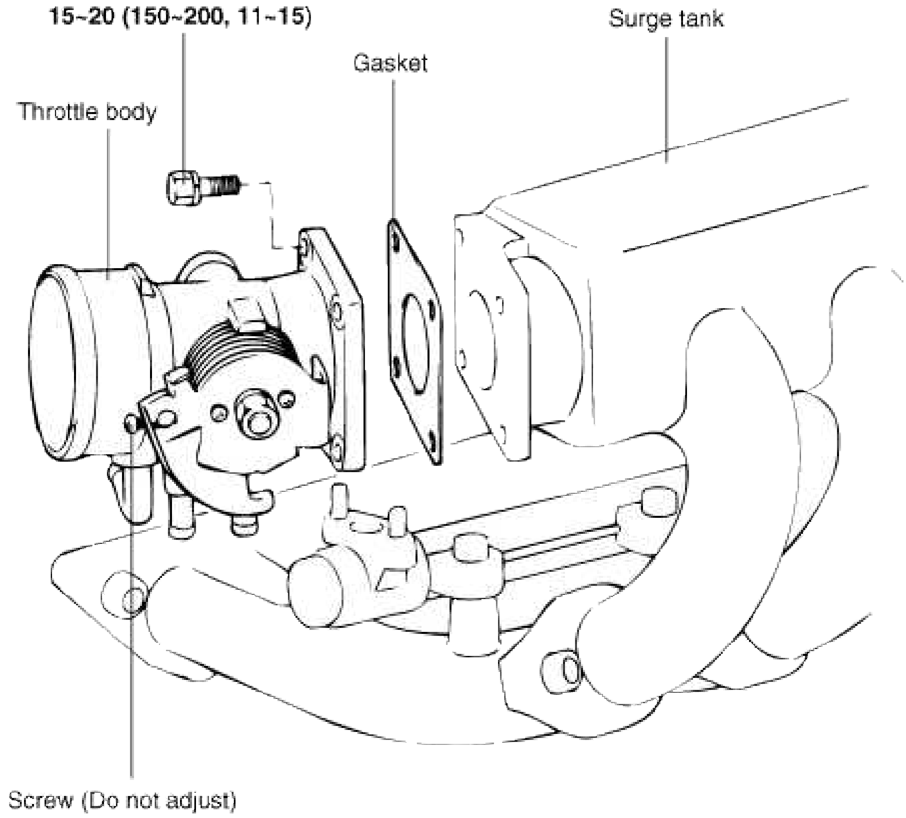
1. Disconnect the connector at the idle speed control actuator.
2. Measure the resistance between terminals.

Standard value
Terminal 1 and 2 : 16.6 ~ 18.6Ω
Terminal 2 and 3 : 14.5 ~ 16.5Ω [at 20°C (68°F)]

3. Connect the connector to the idle speed control actuator.

Fuel System > Engine Control System > Throttle Body > Components and Components Location

COMPONENTS


15~20 (150~200, 11~15)
Surge tank
Gasket
Throttle body
Screw (Do not adjust)

TORQUE : Nm (kg·cm, lb·ft)

Fuel System > Engine Control System > Throttle Body > Repair procedures

REMOVAL

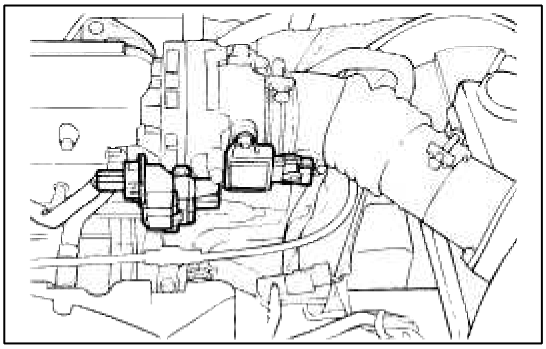
CAUTION

The throttle valve must not be removed.

Remove the throttle position sensor.

NOTE

Except when necessary for replacement, the throttle position sensor must not be removed.

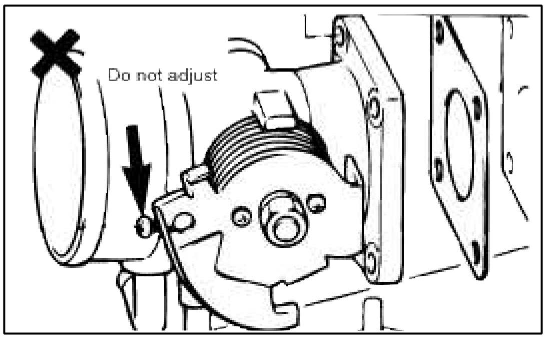


INSPECTION

1. Check the throttle body for cracks.
2. Check for restriction in the vacuum port or passage.
3. Check for interference when moving the accelerator cable.

CAUTION

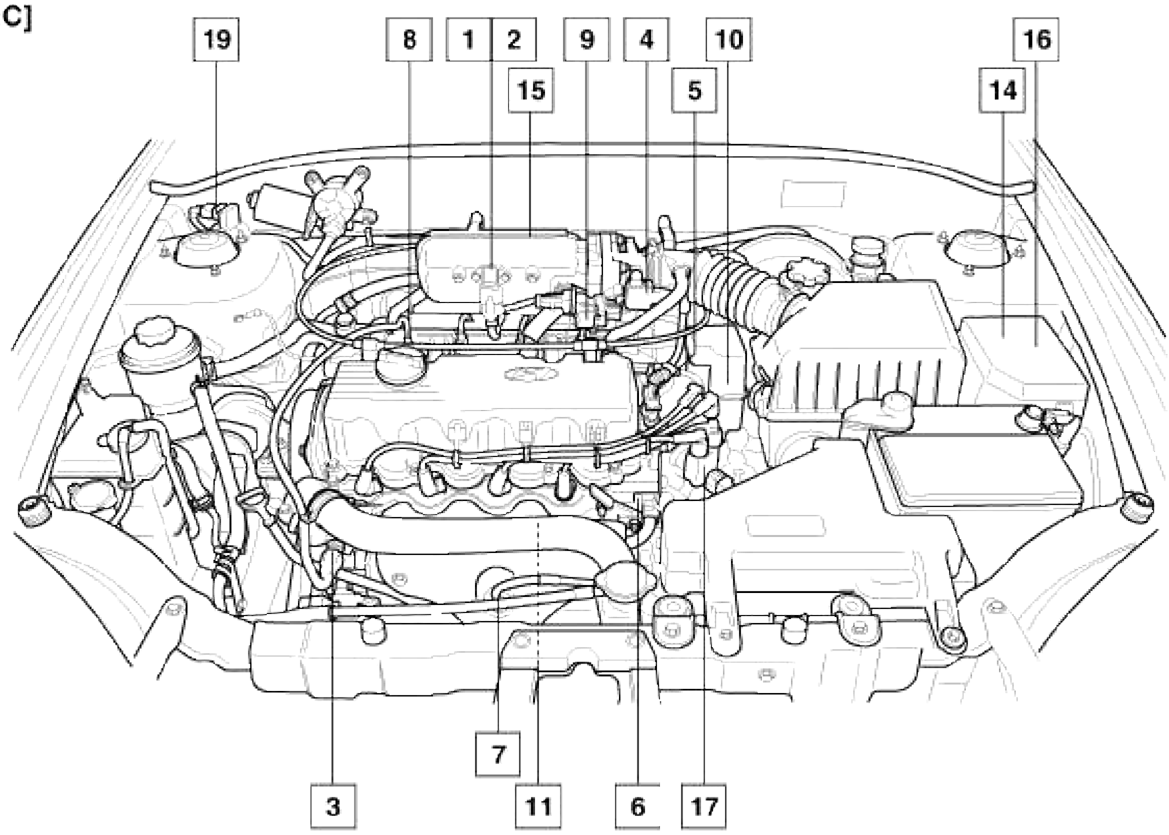
- Throttle valve set screw was adjusted in the production line with the air volume (0.516 ± 5% g/sec) during idling. So please DO NOT ADJUST IT voluntarily.
- When the idle rpm is out of specification, check the relevant sensors and their input or output value first.
- The throttle body does not need to be cleaned because carbon in throttle body does not affect the system's operation at all.



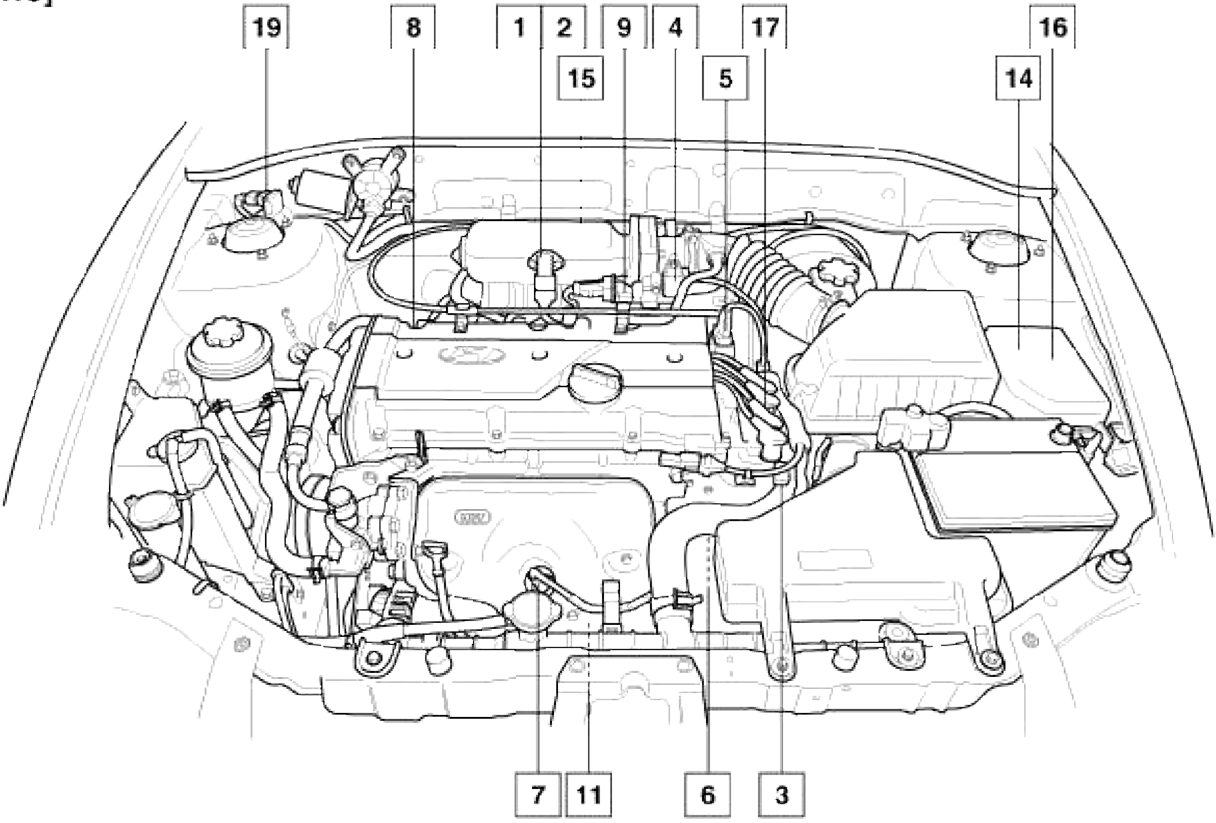
Fuel System > Engine Control System > Components and Components Location

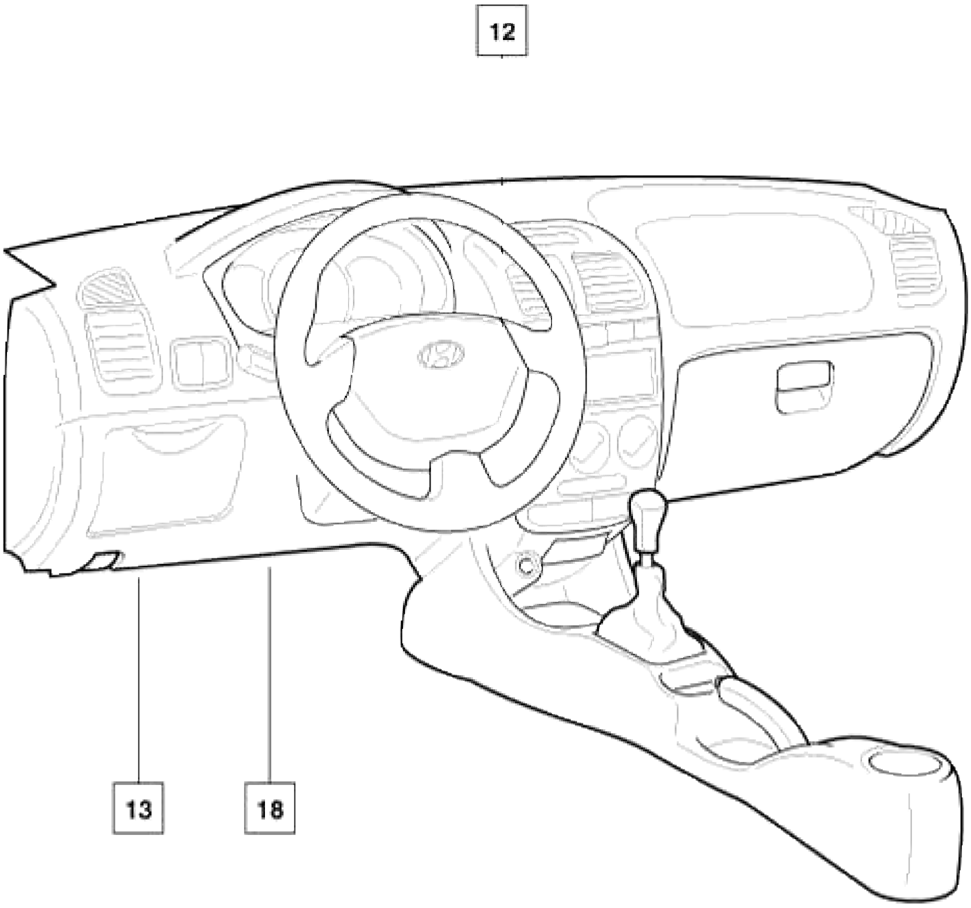
COMPONENTS

[SOHC]


19
8
1
2
9
4
10
16
15
5
14
7
3
11
6
17

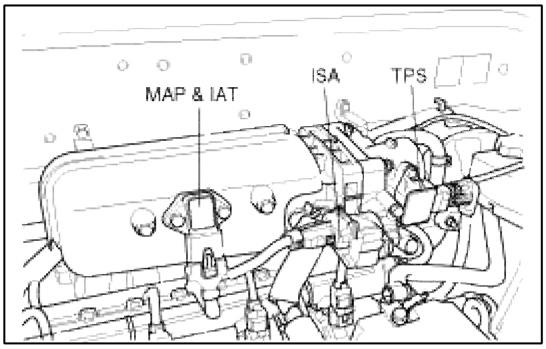
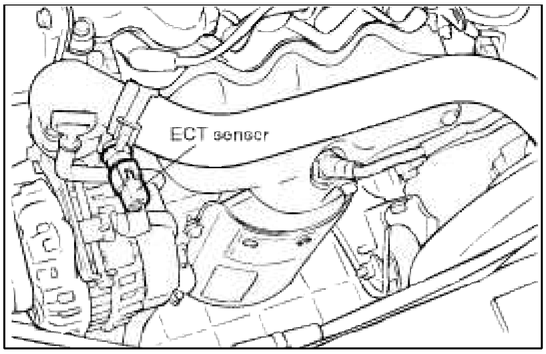
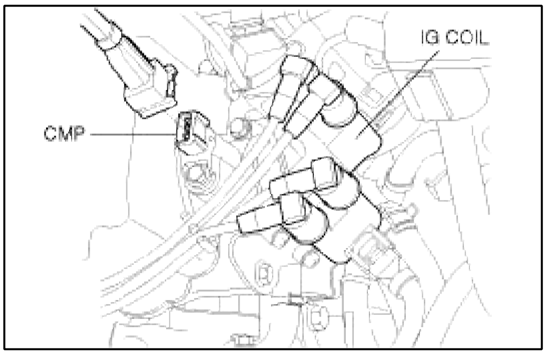
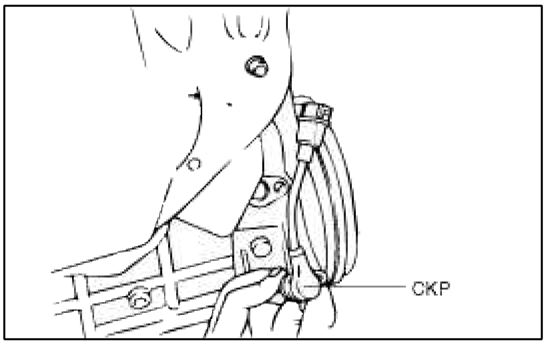
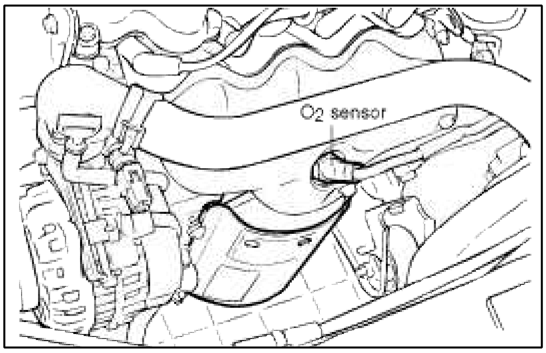
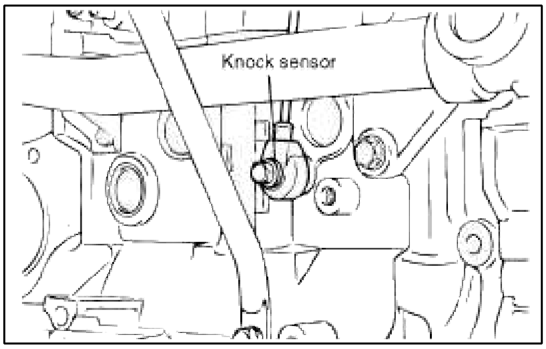
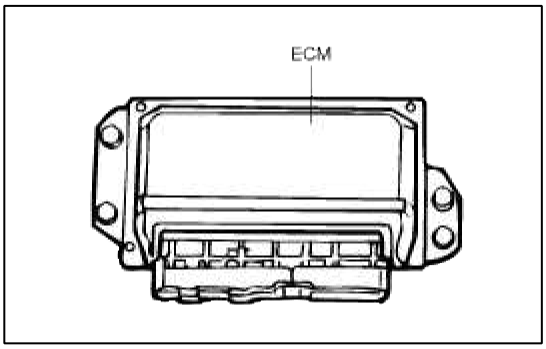
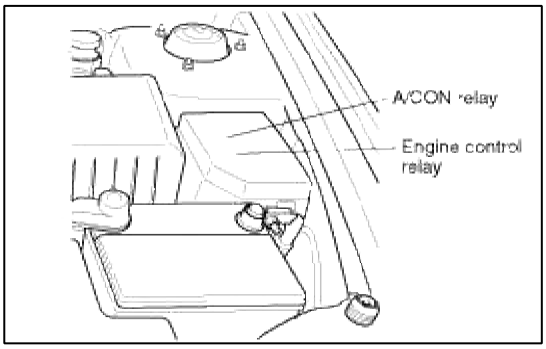
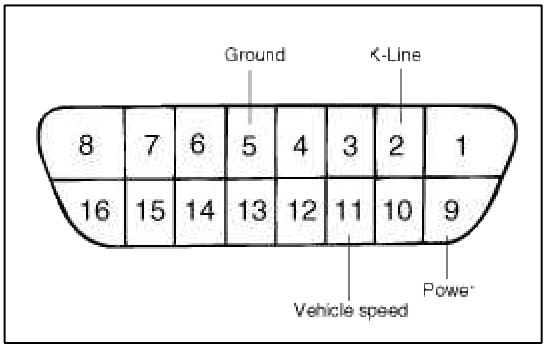
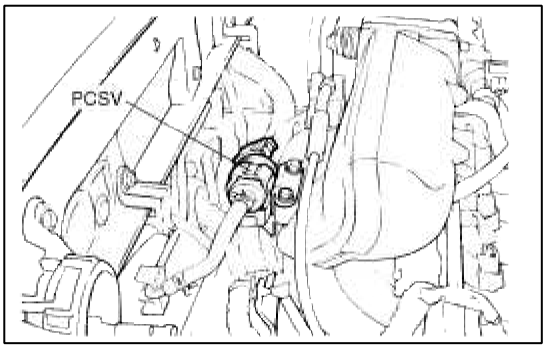
[DOHC]

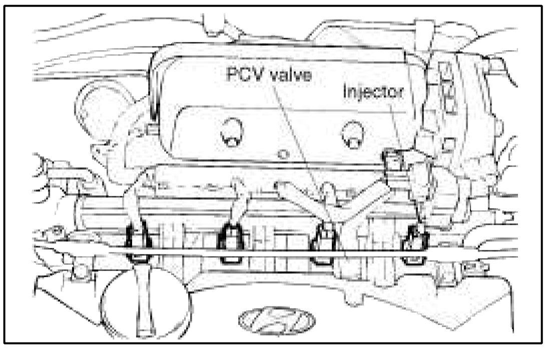
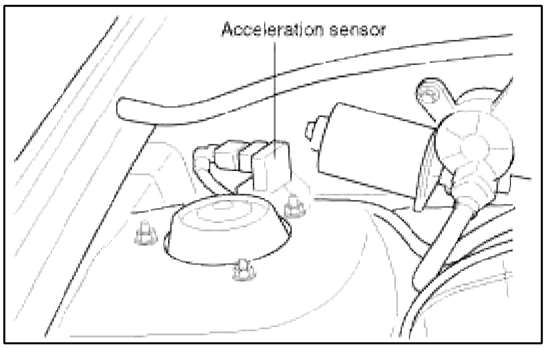
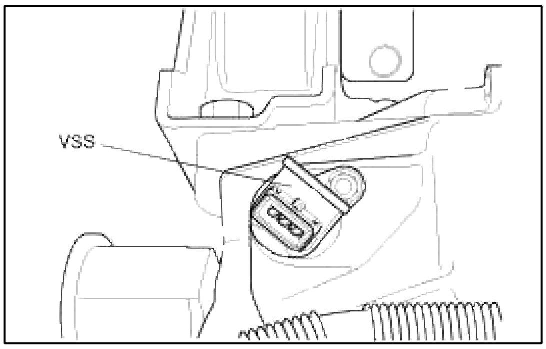

19
8
1
2
9
4
17
16
15
5
14
7
11
6
3



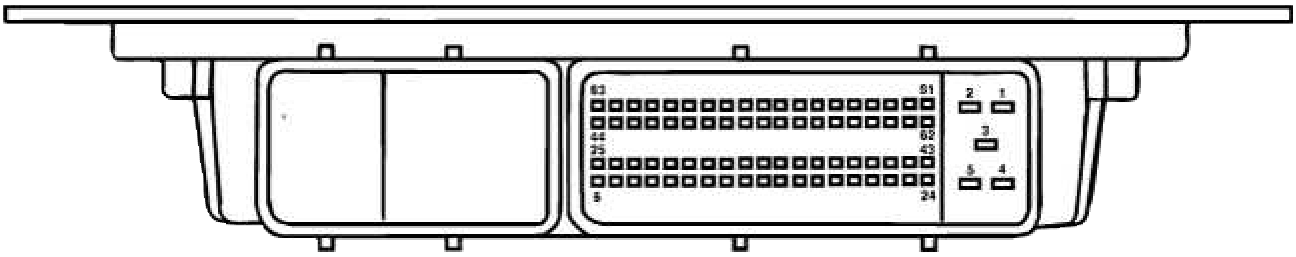
1	Manifold Absolute Pressure (MAP) Sensor	11	Knock sensor
2	Intake Air Temperature (IAT) Sensor	12	Ignition switch
3	Engine Coolant Temperature (ECT) Sensor	13	Engine Control Module (ECM)
4	Throttle Position Sensor (TPS)	14	A/CON Relay
5	Camshaft Position (CMP) Sensor	15	Purge Control Solenoid Valve (PCSV)
6	Crankshaft Position (CKP) Sensor	16	MFI control relay
7	Heated Oxygen Sensor (HO2S)	17	Ignition coil
8	Injector	18	Data link connector
9	Idle Speed Actuator (ISA)	19	Acceleration sensor
10	Vehicle speed sensor (VSS)		

[1], [2], [4], [9]	[3]

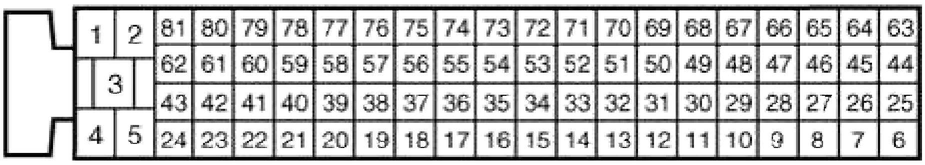
 MAP & IAT ISA TPS	
[5], [17]	**[6]**
	
[7]	**[11]**
	 Knock sensor
[13]	**[14], [16]**
	 A/CON relay Engine control relay
[18]	**[15]**
 Ground K-Line 8 7 6 5 4 3 2 1 16 15 14 13 12 11 10 9 Power Vehicle speed	

[8]	**[19]**
 PCV valve Injector	 Acceleration sensor
[10]	
 	

ECM PIN NUMBER CONFIGURATION


63
81
44
62
25
43
6
24
2
1
3
5
4

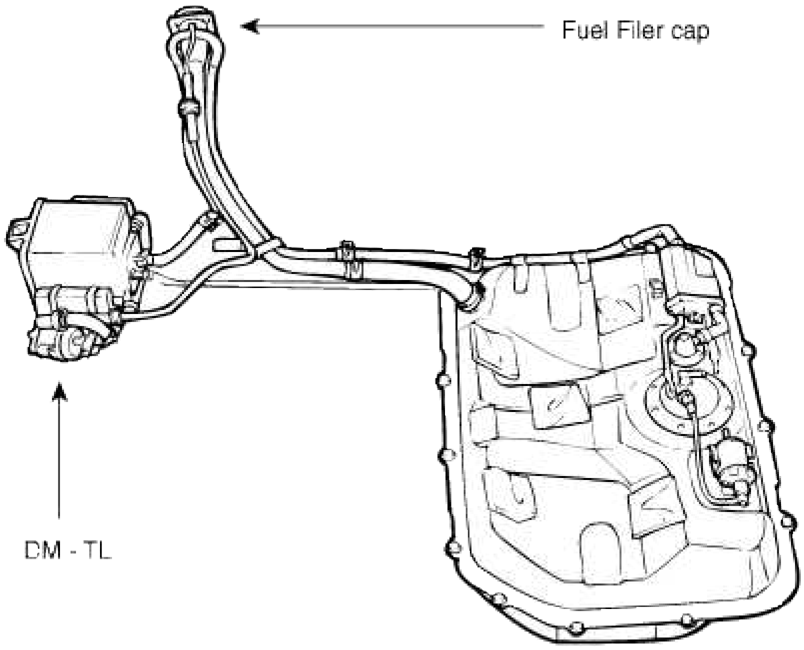
ECM HARNESS PIN NUMBER CONFIGURATION

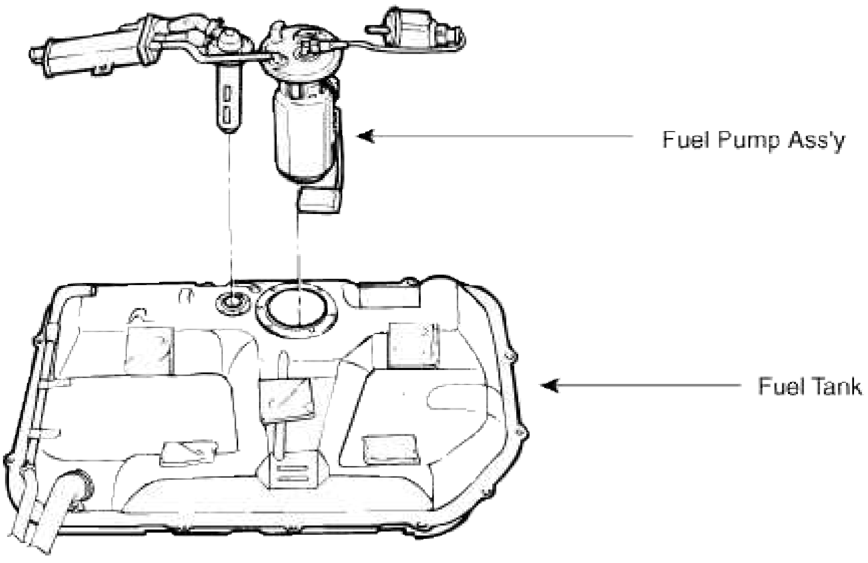


1	2	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63
3		62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47	46	45	44
		43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	5	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6

Fuel System > Fuel Delivery System > Fuel Tank > Components and Components Location

COMPONENTS

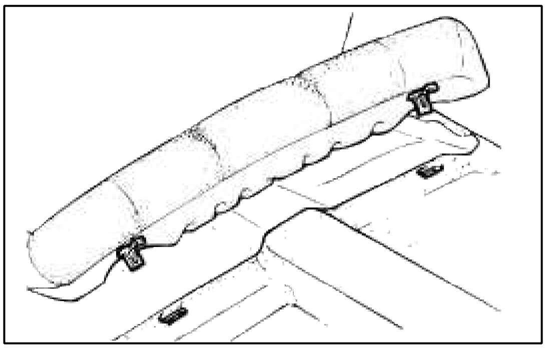

Fuel Filer cap
DM - TL


Fuel Pump Ass'y
Fuel Tank

Fuel System > Fuel Delivery System > Fuel Tank > Repair procedures

REMOVAL

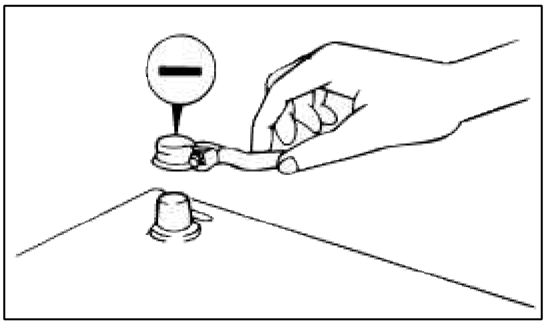
1. Press the two taps under the rear seat and raise the seat, then detach the inspection panel of the fuel pump.



2. To reduce the internal pressure of the fuel lines and hoses, first start the engine with the fuel pump disconnected and wait until it stops by itself.

> **NOTE**
>
> Be sure to reduce the fuel pressure before disconnecting the fuel main pipe and hose, otherwise fuel will spill out.

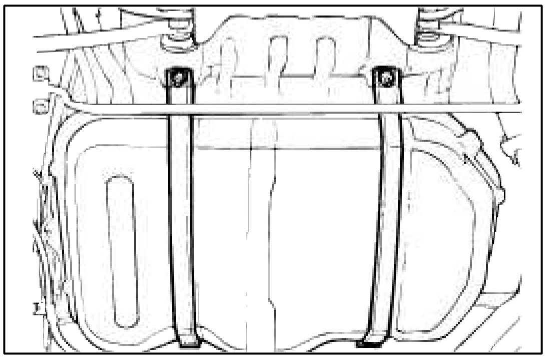
3. Disconnect the battery cable from the negative terminal of the battery.



4. Disconnect the high pressure hose from the fuel filter output side, and disconnect the tap for static electricity.

> **CAUTION**
>
> Cover the hose connection with a shop tower to prevent splashing of fuel that could be caused by residual pressure in the fuel line.

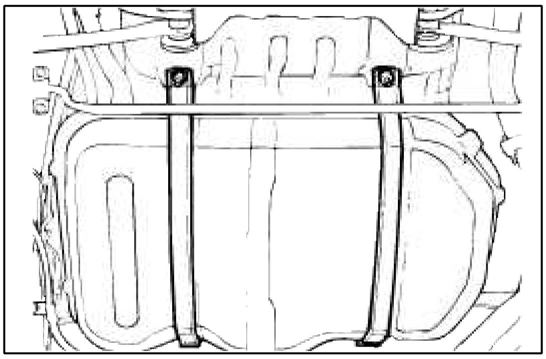
5. Lift up the vehicle.
6. Detach the fuel filler hose and leveling hose.
7. Support the fuel tank with a jack.
8. Remove the fuel tank bands.



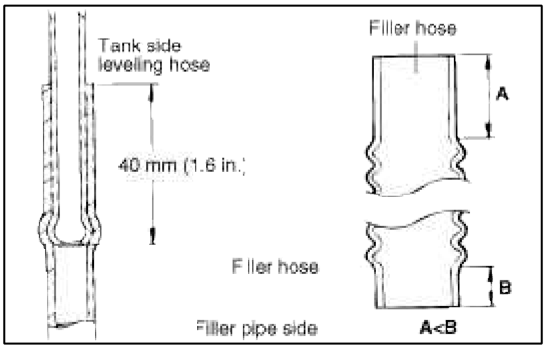
9. Remove the fuel tank.

INSTALLATION

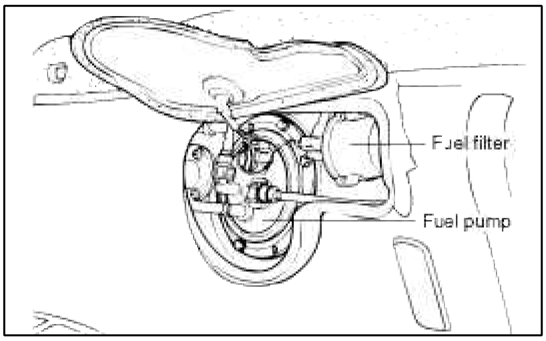
1. Confirm that the pad is fully bonded to the fuel tank, and install the fuel tank by tightening the self-locking nuts.



2. Connect the leveling hose to the tank and at the filler neck by approximately 40mm (1.6 in.).
3. When connecting the filler hose, the end with the shorter straight pipe should be connected to the tank side.

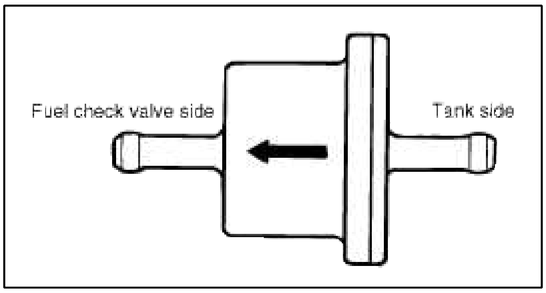

Tank side
leveling hose
40 mm (1.6 in.)
Filler hose
Filler pipe side
Filler hose
A
B
A<B

4. Connect the vapor hose. When attaching the vapor hose to the line, be sure that the hose is attached as shown in the illustration.
5. Connect the high pressure hose to the fuel pump. Be careful that the fuel hose does not twist.
6. Connect the electrical fuel pump connector.


Fuel filter
Fuel pump

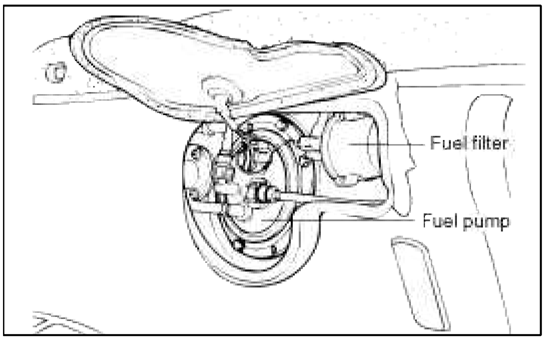
INSPECTION

1. Check the hoses and the pipes for cracks or damage.
2. Check the fuel tank cap for proper operation.
3. Check the fuel tank for deformation, corrosion or cracking.
4. Check the inside of the fuel tank for dirt or foreign material.
5. Check the in-tank fuel filter for damage or restriction.
6. Test the two-way valve for proper operation
7. To check the two-way valve, lightly blow into the inlet and outlet. If air passes through after slight resistance, then the valve is good.

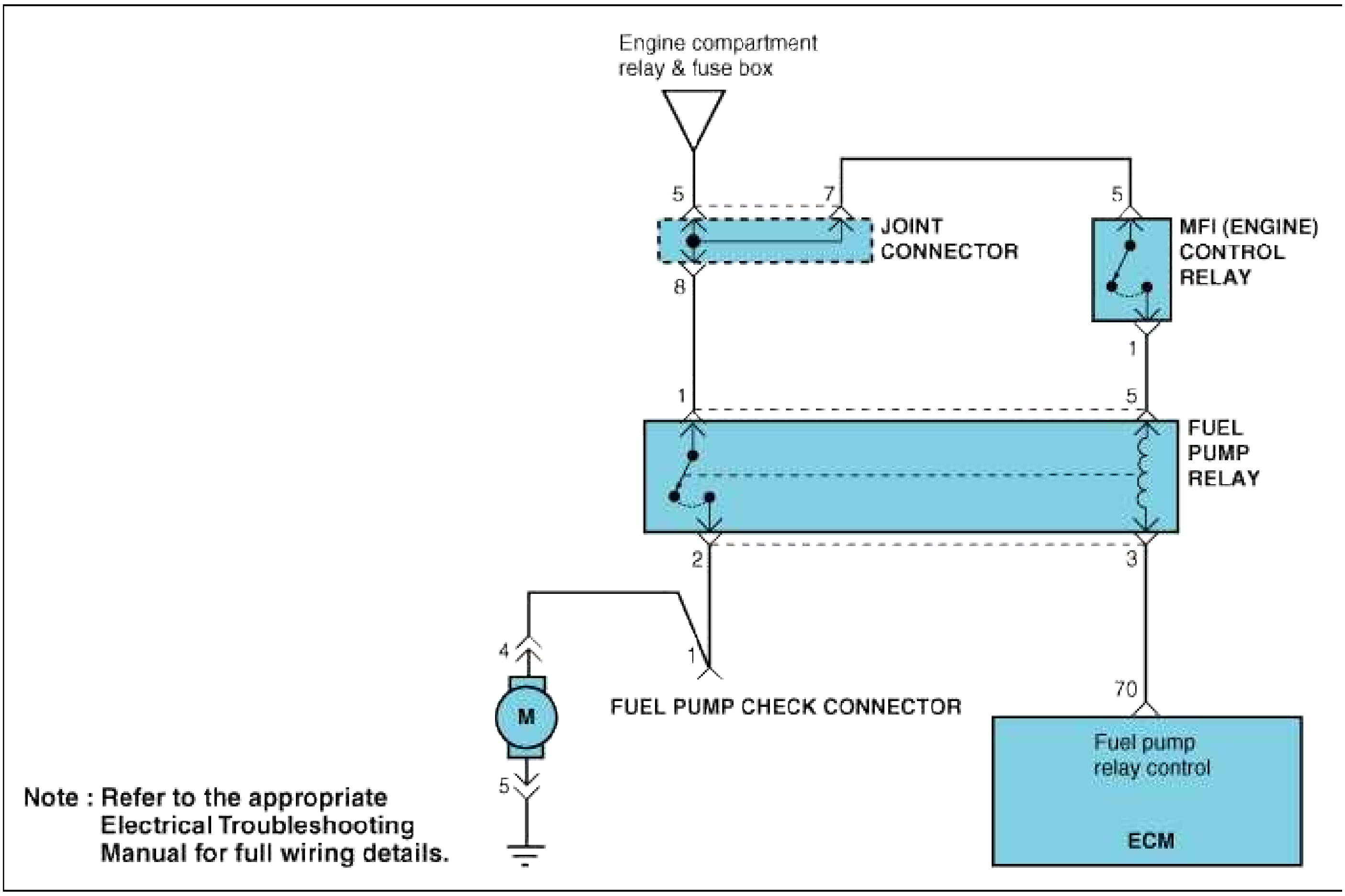

Fuel check valve side
Tank side

Fuel System > Fuel Delivery System > Fuel Pump > Troubleshooting

FUEL PUMP

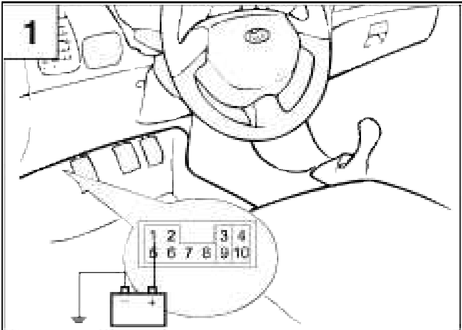

Fuel filter
Fuel pump

CIRCUIT DIAGRAM

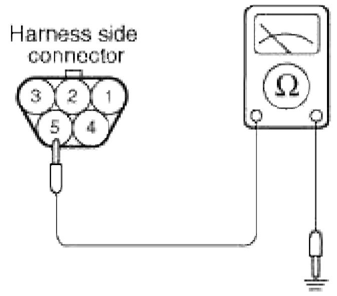
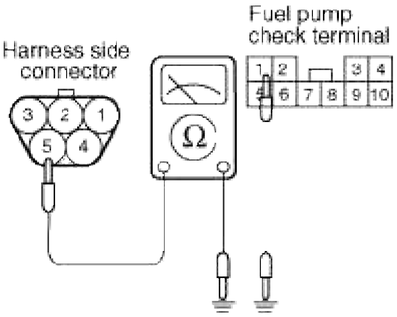
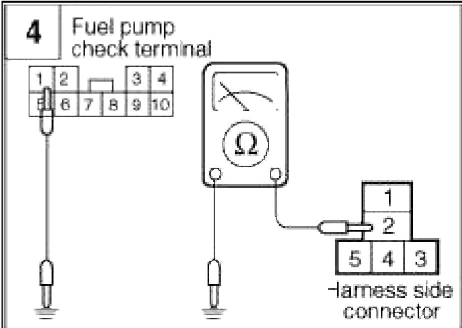
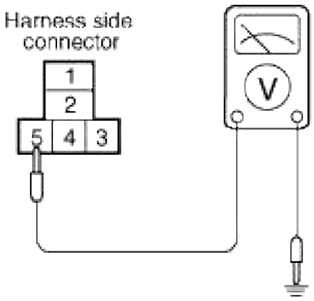
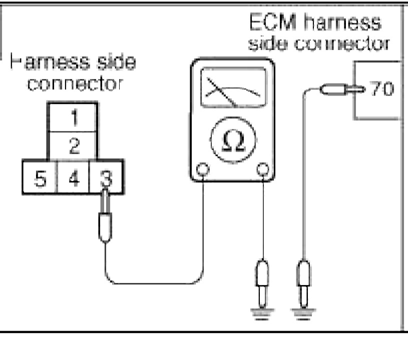

Engine compartment relay & fuse box
5
7
5
JOINT CONNECTOR
8
MFI (ENGINE) CONTROL RELAY
1
1
5
FUEL PUMP RELAY
2
3
4
1
M
5
FUEL PUMP CHECK CONNECTOR
70
Fuel pump relay control
ECM

Note : Refer to the appropriate Electrical Troubleshooting Manual for full wiring details.

HARNESS INSPECTION PROCEDURES

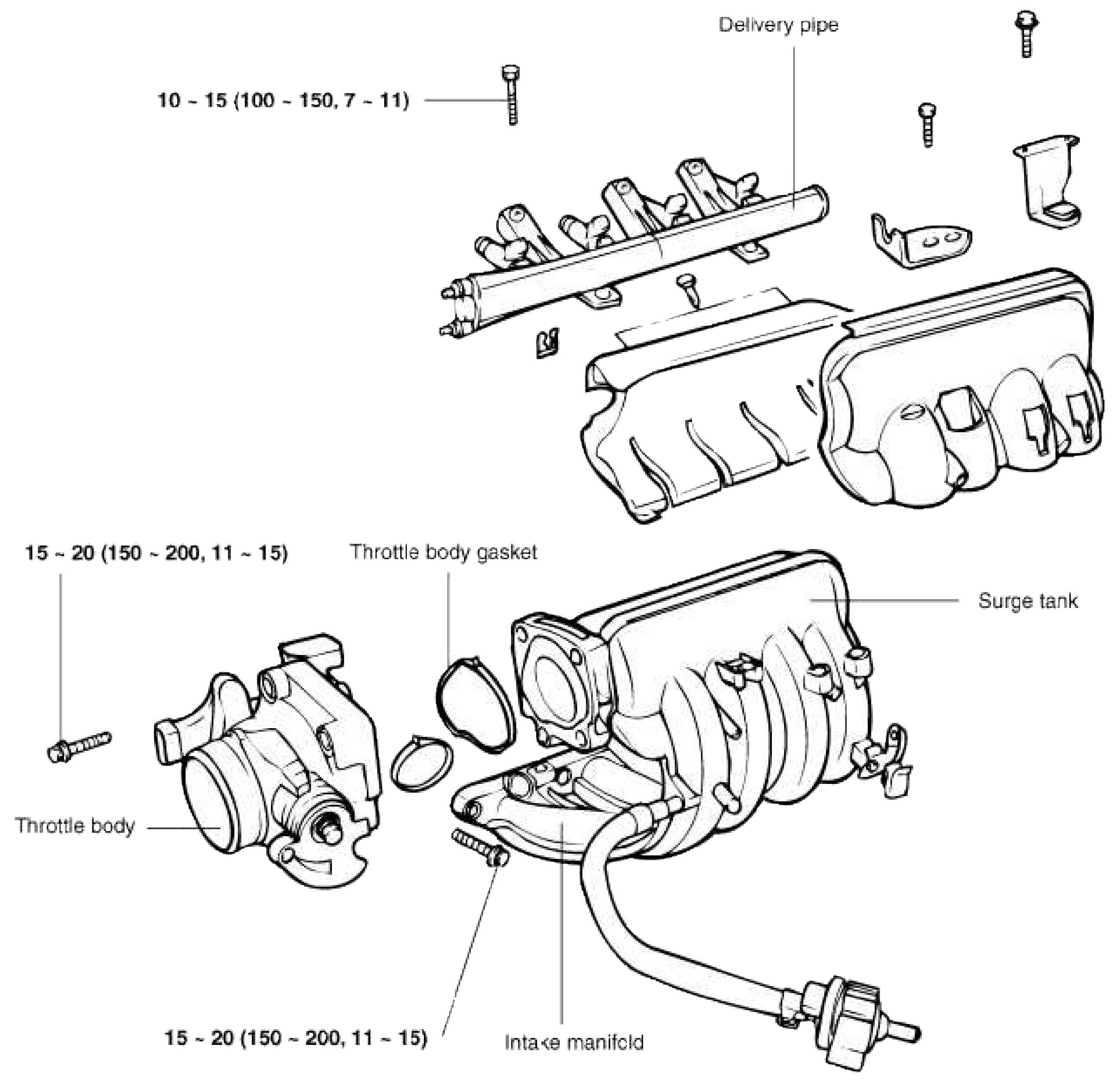
	Check the fue pump. • Apply battery voltage to the checking terminal and operate the pump.	**OK** ⇨ **NG** ⇨	4 2

1
1 2 3 4
5 6 7 8 9 10

2	 Harness side connector 3 2 1 5 4 Ω	Check the ground circuit of the fuel pump. - Connector : Disconnected	**OK** ⇨ **NG** ⇨	3 Repair the harness.
3	 Fuel pump check terminal Harness side connector 3 2 1 5 4 Ω 1 2 3 4 5 6 7 8 9 10	Check for continuity between the fuel pump and the check terminal. - Connector : Disconnected	**OK** ⇨ **NG** ⇨	4 Repair the harness.
4	 Fuel pump check terminal 1 2 3 4 5 6 7 8 9 10 Ω 1 2 5 4 3 Harness side connector	Check for continuity between the check terminal and the fuel pump control relay terminal. - Control relay connector : Disconnected	**OK** ⇨ **NG** ⇨	5 Repair the harness.
5	 Harness side connector 1 2 5 4 3 V	Measure the power supply voltage of the control relay. - Control relay connector : Disconnected - Ignition switch : START - Voltage (V) : System voltage	**OK** ⇨ **NG** ⇨	6 Repair the harness.
6	 ECM harness side connector Harness side connector 1 2 5 4 3 Ω 70	Check for an open-circuit or a short-circuit to ground between the control relay and the ECM. - Control relay connector : Disconnected - ECM connector : Disconnected	**OK** ⇨ **NG** ⇨	**END!** Repair the harness.

Fuel System > Fuel Delivery System > Injector > Components and Components Location

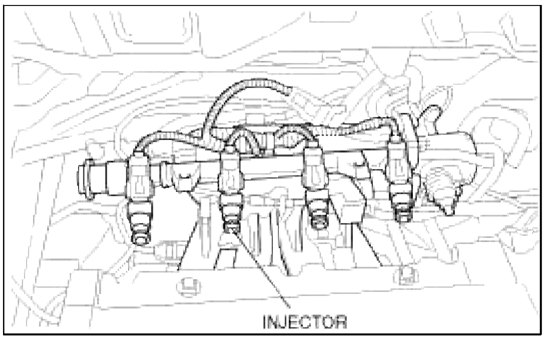
COMPONENTS


Delivery pipe
10 ~ 15 (100 ~ 150, 7 ~ 11)
15 ~ 20 (150 ~ 200, 11 ~ 15)
Throttle body gasket
Surge tank
Throttle body
15 ~ 20 (150 ~ 200, 11 ~ 15)
Intake manifold
TORQUE : Nm (kg.cm, lb.ft)

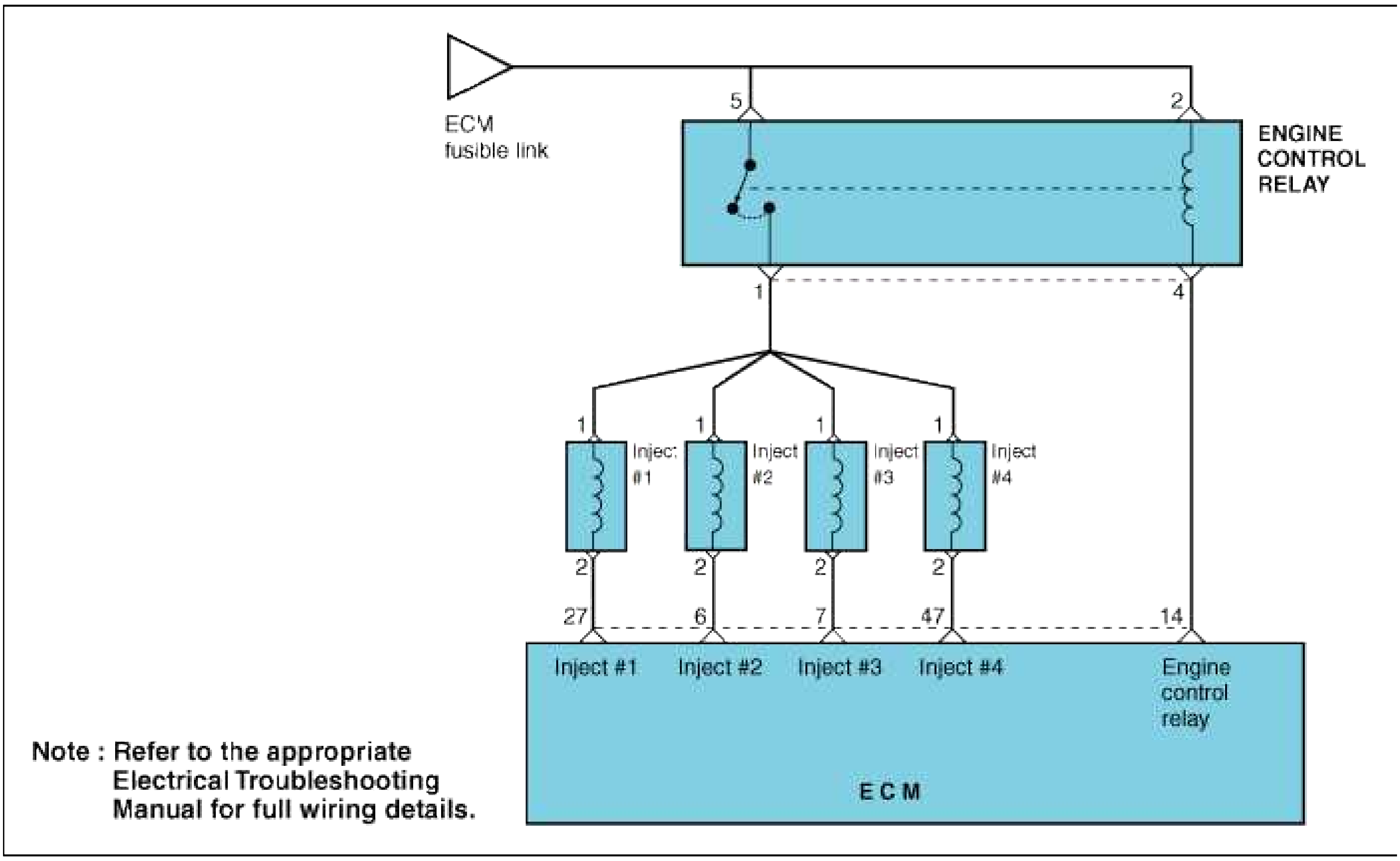
Fuel System > Fuel Delivery System > Injector > Troubleshooting

INJECTORS

The injectors inject fuel according to a signals from the ECM. The volumeof fuel injected by the injector is determined by the time during which thesolenoid valve is energized.



CIRCUIT DIAGRAM


ECM
fusible link
5
2
ENGINE
CONTROL
RELAY
1
4
1
1
1
1
Inject
#1
Inject
#2
Inject
#3
Inject
#4
2
2
2
2
27
6
7
47
14
Inject #1
Inject #2
Inject #3
Inject #4
Engine
control
relay
E C M
Note : Refer to the appropriate
Electrical Troubleshooting
Manual for full wiring details.

TROUBLESHOOTING HINTS

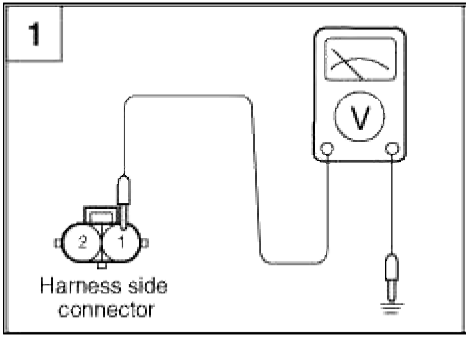
1. If the engine is difficult to start when it is hot, check low for fuel pressure and injector leaks.
2. If the injector does not operate when the engine is cranked, then check the following :
   - Faulty power supply circuit to the ECM or faulty ground circuit.
   - Faulty MFI control relay.
   - Faulty crankshaft position sensor or camshaft position sensor.
3. If engine idle remains unchanged when fuel injection to the cylinders is cut one after another, check for the following items about such cylinder :
   - Injector and harness.
   - Spark plug and high tension cable.
   - Compression pressure.
4. If the injection system is OK but the injector drive time is out of specification, check for the following items :
   - Poor combustion in the cylinder (faulty spark plug, ignition coil, compression pressure, etc.)
5. The MIL is on or the DTC is displayed on the HI-SCAN under the following condition.
   - When the injector itself is faulty.

USING HI-SCAN

Check item	Data display	Check conditions	Engine state	Test specification
Injectors	Injector duration	• Engine coolant temperature : 80 to 95°C (176 to 205°F) • Lamps, electric cooling fan, accessory units : ALL OFF • Transaxle : Neutral (P range for vehicle with A/T) • Steering wheel : Neutral	Idle rpm	1.5 ~ 4.5 ms
			2000 rpm	
			3000 rpm	
			Racing	Increasing

Check item	Check condition	HI-SCAN display	Type
Injector • Actuator test	Start the engine	01. No.1 Injector	Activate
		02. No.2 Injector	Activate
		03. No.3 Injector	Activate
		04. No.4 Injector	Activate

HARNESS INSPECTION PROCEDURES

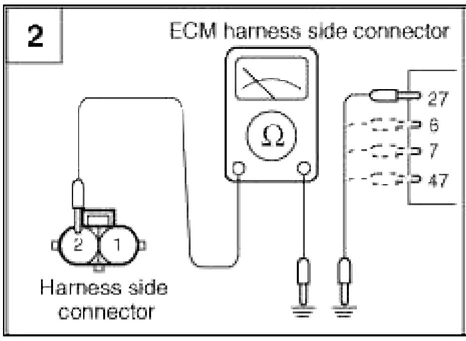


Measure the power supply voltage of the injector.

- Connector : Disconnected
- Ignition switch : ON
- Voltage (V) : Battery voltage

OK ⇨ 2

NG ⇨ Repair the harness.



Check for an open-circuit, or a short-circuit to ground between the engine control module and the injector.

- ECM connector : Disconnected
- Injector connector : Disconnected

OK ⇨ END!

NG ⇨ Repair the harness.

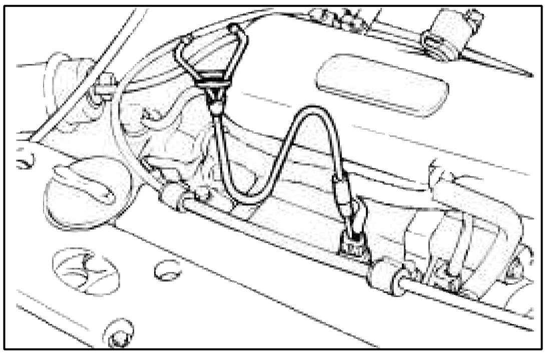
INJECTOR INSPECTION

OPERATION CHECK

Using a HI-SCAN :

- Activate the fuel injectors in sequence.

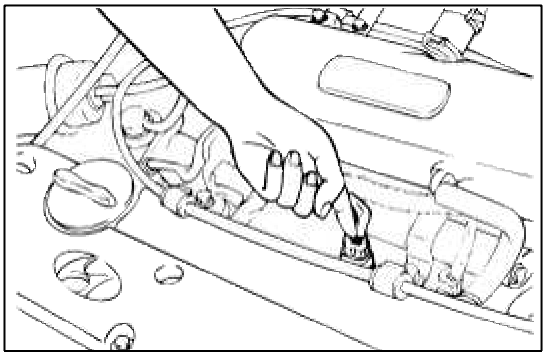
- Check the operating time of the injectors.



1. Using a stethoscope, check the injectors for a clicking sound at idle. Check that the sound is produced at shorter intervals as the engine speed increases.

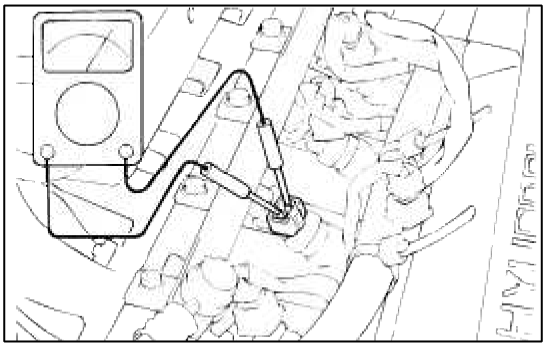
> **NOTE**
>
> Ensure that the sound from an adjacent injector is not being transmitted along the delivery pipe to an inoperative injector.

2. If a stethoscope is not available, check the injector operation with your finger.
   If no vibrations are felt, check the wiring connector, injector, or injection signal from ECM.



RESISTANCE MEASUREMENT BETWEEN TERMINALS

1. Disconnect the connector of the injector and measure the resistance betweenthe two terminals.



15.9 ± 0.35Ω [at 20°C (68°F)]

---

2. Re-connect the connector to the injector.

Fuel System > Fuel Delivery System > Injector > Repair procedures

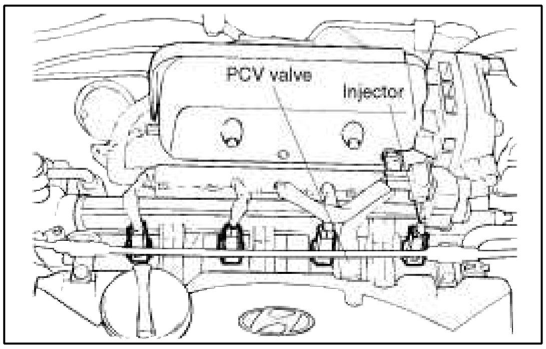
REMOVAL

1. Release residual pressure from the fuel line to prevent fuel from spilling.

> **CAUTION**
>
> Cover the hose connection with rags to prevent splashing of fuel that could be caused by residual pressure in the fuel line.

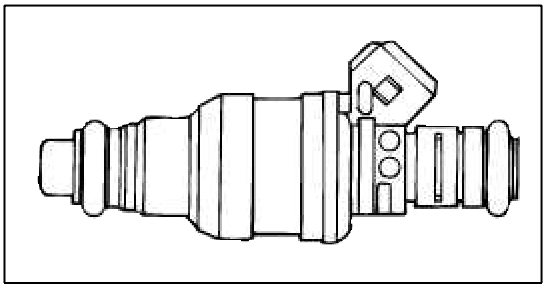
2. Remove the delivery pipe with the fuel injectors.

> **CAUTION**
>
> - Be careful not to drop any injectors when removing the delivery pipe.
> - Be aware that fuel may flow out when removing the injector.



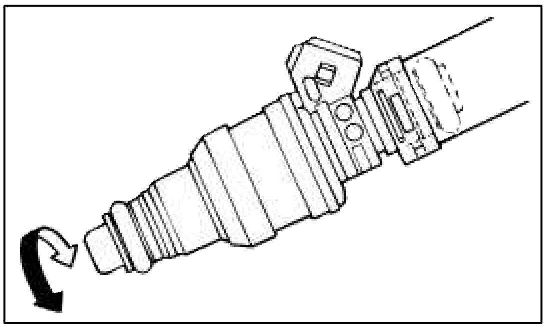
INSTALLATION

1. Install a new grommet and O-ring to the injector.
2. Apply a coating of solvent, spindle oil or gasoline to the O-ring of the injector.



3. While turning the injector to the left and right, fit it on to the delivery pipe.
4. Be sure the injector turns smoothly.

> **NOTE**
>
> If it does turn smoothly, the O-ring may be jammed: Remove the injector and re-insert it into the delivery pipe and recheck.

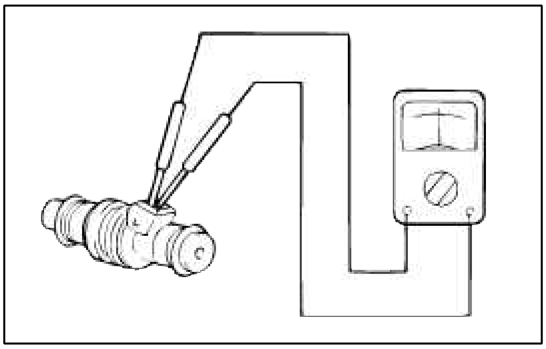


INSPECTION

1. Measure the resistance of the injectors between the terminals using an ohmmeter.

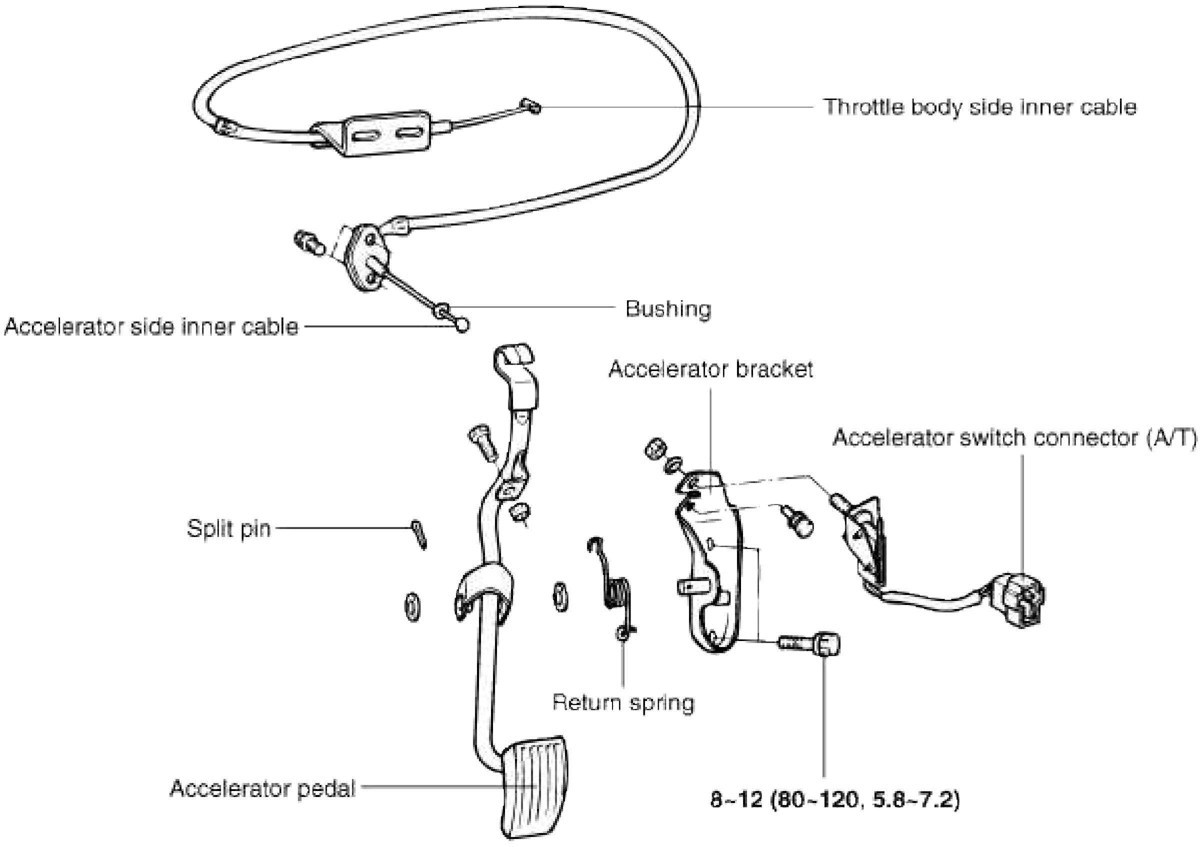
Resistance : 15.9 ± 0.35Ω [at 20°C (68°F)]

2. If the resistance is not within specifications, replace the injector.



Fuel System > Fuel Delivery System > Accelerator Pedal and Cable > Components and Components Location

COMPONENTS

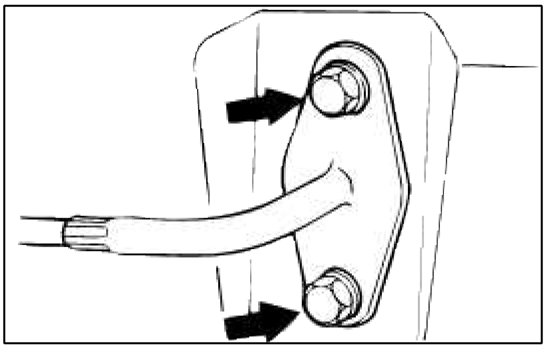

Throttle body side inner cable
Bushing
Accelerator side inner cable
Accelerator bracket
Accelerator switch connector (A/T)
Split pin
Return spring
Accelerator pedal
8~12 (80~120, 5.8~7.2)

TORQUE : Nm (kg·cm, lb·ft)

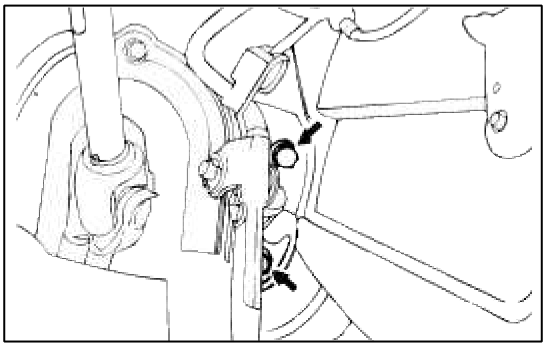
Fuel System > Fuel Delivery System > Accelerator Pedal and Cable > Repair procedures

REMOVAL

1. Remove the bushing and inner cable of the accelerator arm side.

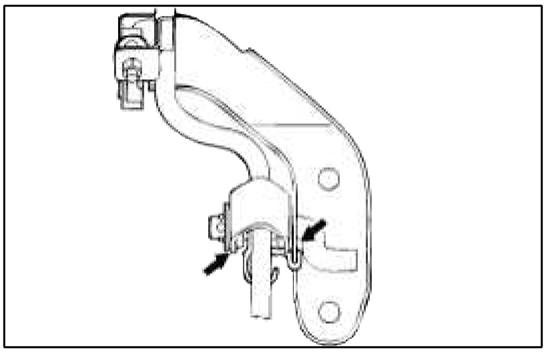


2. After disconnecting the accelerator switch connector, loosen the bolts of the accelerator arm bracket and remove.



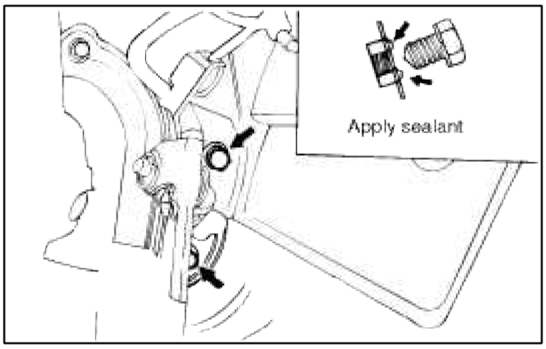
INSTALLATION

1. When installing the return spring and accelerator arm, apply multi-purpose grease around each moving point of the accelerator arm.



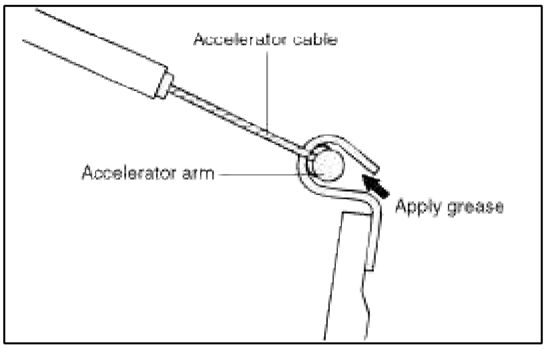
2. Apply sealant to the bolt mounting hole, and tighten the accelerator arm bracket.

Tightening torque
Accelerator arm bracket bolts :
8 ~ 12 Nm (80 ~ 120 kg·cm, 5.8 ~ 7.2 lb·ft)



3. Securely install the resin bushing of the accelerator cable on the end of the accelerator arm.

4. Apply multipurpose grease around the cable end.

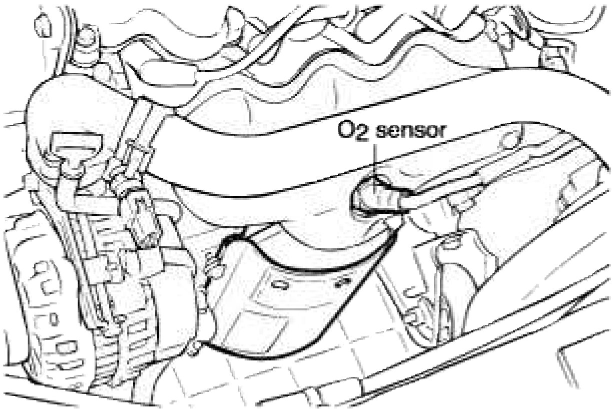


INSPECTION

1. Check the inner and outer cable for damage.
2. Check the cable for smooth movement.
3. Check the accelerator arm for deformation.
4. Check the return spring for deterioration.
5. Check the connection of the bushing to end metal fitting.
6. Check that the accelerator switch operates properly.

Fuel System > Troubleshooting > P0030

COMPONENT LOCATION



GENERAL DESCRIPTION

In order to control the emission of the CO, HC and NOx components of the exhaust gas, a heated oxygen sensor (HO2S), mounted on the front side and rear side of the catalytic converter, detects the oxygen content in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation. The HO2S requires a minimum temperature to operate properly and provide a closed loop fuel control system. So the HO2S contains a heater element to reduce warm-up time and ensure proper performance during all driving conditions, which allows for closed loop fuel control or catalyst monitoring immediately upon engine start-up. The ECM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the PCM provides a ground circuit for activating the heater.

DTC DESCRIPTION

The PCM determines front HO2S heater fault and sets DTC P0030 if the front HO2S heater control driver inside the PCM fails or HO2S is not operational after an elapse of predetermined time since engine start or front HO2S tip temperature is out of normal working range.

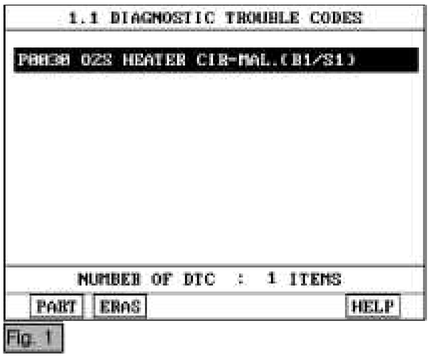
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Heater current check	● Contaminated, deteriorated or aged HO2S ● Heater resistance out of reasonable range ● Faulty HO2S heater ● Faulty PCM ● Misplaced, bent, loose or corroded terminals
Threshold value	● Internal resistance > threshold f(exh. temp.,heater power)	
Enable Conditions	● Exhaust gas temperature (model) 320-800 degC (608 °F~ 1472 °F) ● Dew point end detected Battery voltage 10.7-15.6 V	
Diagnostic Time	● Continuous	
Fail Safe	● Heater open loop control	

MONITOR DTC STATUS

This is the inspection procedure to determine whether it is present DTC or memoried one by monitoring the current signal or by using the function of oscilloscope with Hi-scan pro.

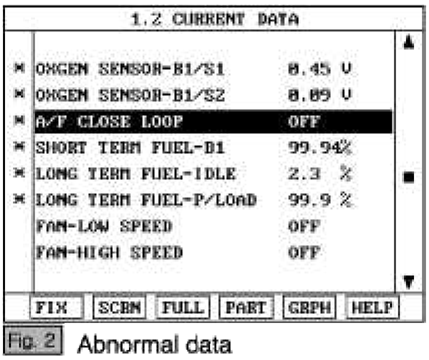
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "A/F CLOSE LOOP" parameter on the scantool.



```
        1.1 DIAGNOSTIC TROUBLE CODES
P0030 O2S HEATER CIR-MAL.(B1/S1)

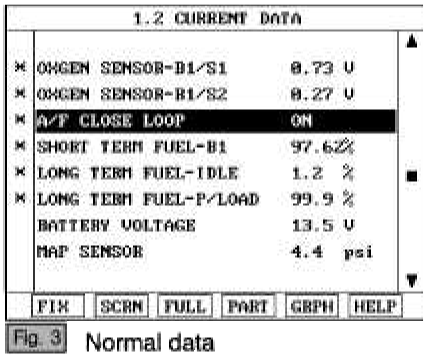
         NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
              1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1         0.45 V
* OXGEN SENSOR-B1/S2         0.09 V
* A/F CLOSE LOOP             OFF
* SHORT TERM FUEL-B1         99.94%
* LONG TERM FUEL-IDLE        2.3  %
* LONG TERM FUEL-P/LOAD      99.9 %
  FAN-LOW SPEED              OFF
  FAN-HIGH SPEED             OFF
```

Fig. 2 Abnormal data



```
              1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1         0.73 V
* OXGEN SENSOR-B1/S2         0.27 V
* A/F CLOSE LOOP             ON
* SHORT TERM FUEL-B1         97.62%
* LONG TERM FUEL-IDLE        1.2  %
* LONG TERM FUEL-P/LOAD      99.9 %
  BATTERY VOLTAGE            13.5 V
  MAP SENSOR                 4.4  psi
```

Fig. 3 Normal data

> **NOTE**
>
> The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

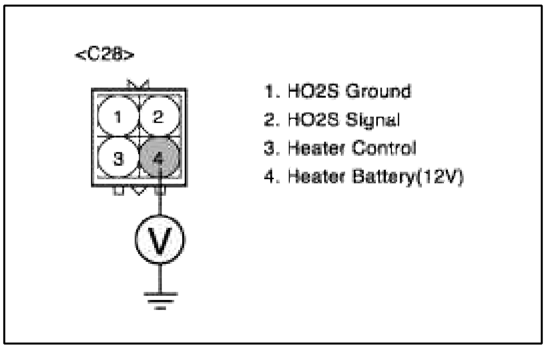
Repair as necessary and go to "Verification of vehicle Repair" procedure

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of sensor harness connector and chassis ground.


<C28>
1
2
3
4
V
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

5. Is measure voltage within Specification?

YES

Go to "Control circuit inspection" procedure.

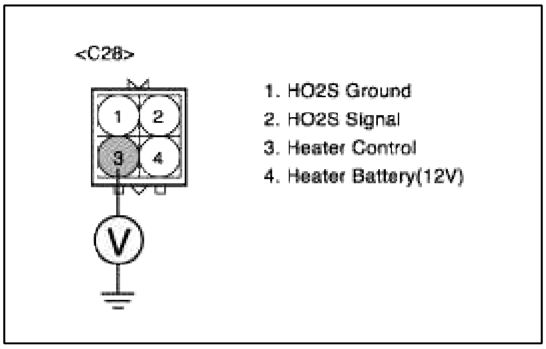
NO

Open or short circuit to chassis ground between HO2S harness connector and control relay.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when checking sensor voltage,the output voltage is 0V.
> Possible cause: Blown fuse or open circuit in harness between E/C-J/BOX and terminal 4 of HO2S heater.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of sensor harness connector.


<C28>
1
2
3
4
V
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

5. Is measure voltage within Specification?

YES

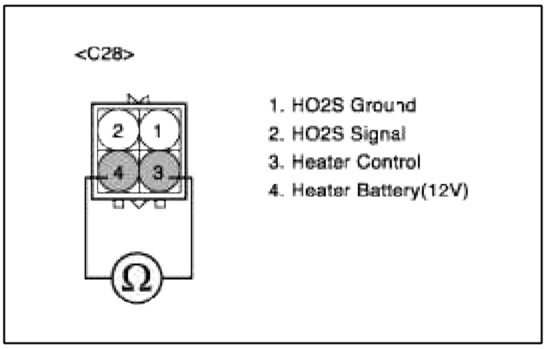
Go to "Component Inspection" procedure.

NO

Check for open or Short to ground in control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S heater
   (1) Measure resistance between terminal 3 and 4 of sensor connector(To sensor side)



(2) Is measure resistance within Specification?

YES

Substitute with a known good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good HO2S heater and check for proper operation. If the problem is corrected, replace HO2S heater and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

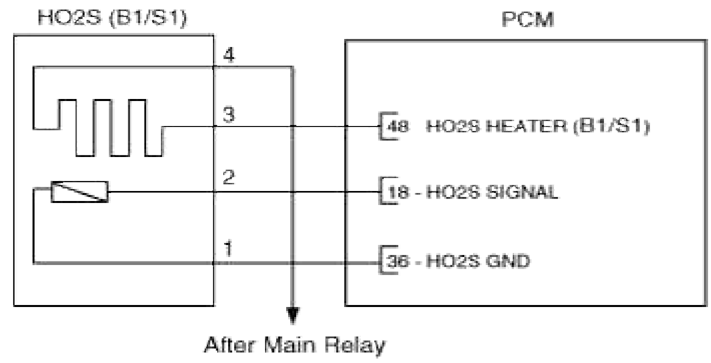
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

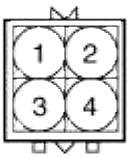
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 36	Ground
2	PCM Terminal 18	HO2S Signal
3	PCM Terminal 48	HO2S Heater (B1/S1)
4	Main Relay	Battery Voltage

[HARNESS CONNECTORS]



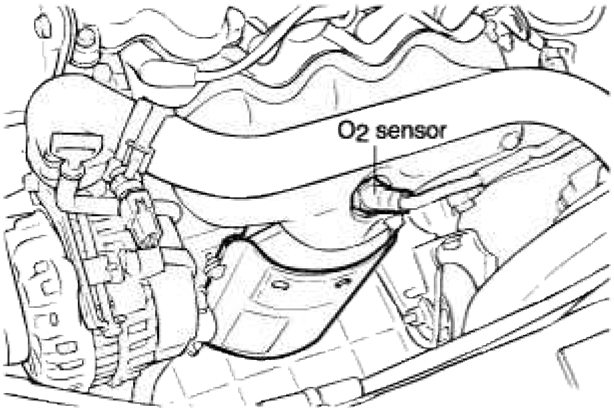
HO2S (B1/S1)

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	●	47	46	45	44
		★	42	★	★	39	38	37	●	35	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	●	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Fuel System > Troubleshooting > P0031

COMPONENT LOCATION



GENERAL DESCRIPTION

In order to control the emission of the CO, HC and NOx components of the exhaust gas, a heated oxygen sensor (HO2S), mounted on the front side and rear side of the catalytic converter, detects the oxygen content in the exhaust gas. The front HO2S signal is used to control air/fuel ratio (closed loop fuel control) and the rear HO2S signal is used to monitor front HO2S and catalyst for proper operation. The HO2S requires a minimum temperature to operate properly and provide a closed loop fuel control system. So the HO2S contains a heater element to reduce warm-up time and ensure proper performance during all driving conditions, which allows for closed loop fuel control or catalyst monitoring immediately upon engine start-up. The PCM controls this heater element by duty cycle. The main relay supplies voltage to the heater and the PCMprovides a ground circuit for activating the heater.

DTC DESCRIPTION

PCM sets DTC P0031 if the PCM detects that the front HO2S heater control line is short to ground.

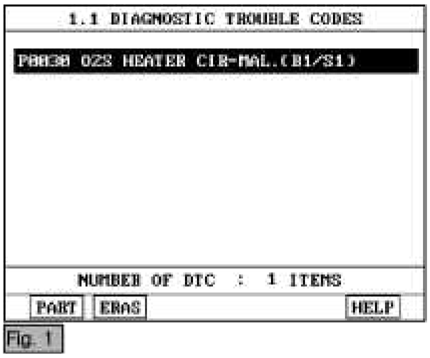
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Heater check, low	● Open in battery and control circuit ● Short to ground in control circuit (pin 48 to 36) ● Faulty HO2S heater ● Faulty PCM
Threshold value		
Enable Conditions	● Open or short circuit	
Diagnostic Time	● Continuous	
Fail Safe	● Heater open loop control	

MONITOR DTC STATUS

This is the inspection procedure to determine whether it is present DTC or memoried one by monitoring the current signal or by using the function of oscilloscope with Hi-scan pro.

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "A/F CLOSE LOOP" parameter on the scantool.

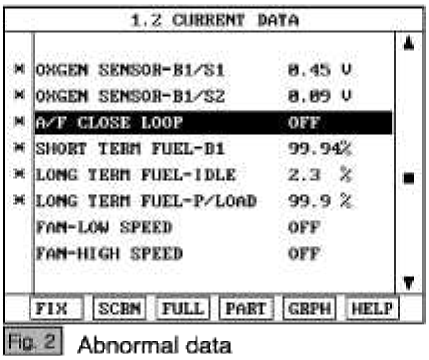


```
1.1 DIAGNOSTIC TROUBLE CODES

P0030 O2S HEATER CIR-MAL.(B1/S1)

NUMBER OF DTC  :  1 ITEMS
```

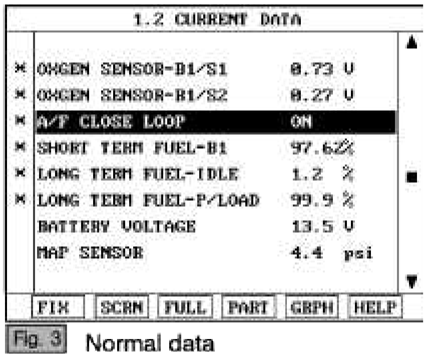
Fig. 1



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1        0.45 V
* OXGEN SENSOR-B1/S2        0.09 V
* A/F CLOSE LOOP            OFF
* SHORT TERM FUEL-B1        99.94%
* LONG TERM FUEL-IDLE       2.3  %
* LONG TERM FUEL-P/LOAD     99.9 %
  FAN-LOW SPEED             OFF
  FAN-HIGH SPEED            OFF
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1        0.73 V
* OXGEN SENSOR-B1/S2        0.27 V
* A/F CLOSE LOOP            ON
* SHORT TERM FUEL-B1        97.62%
* LONG TERM FUEL-IDLE       1.2  %
* LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.5 V
  MAP SENSOR                4.4  psi
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL AND CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

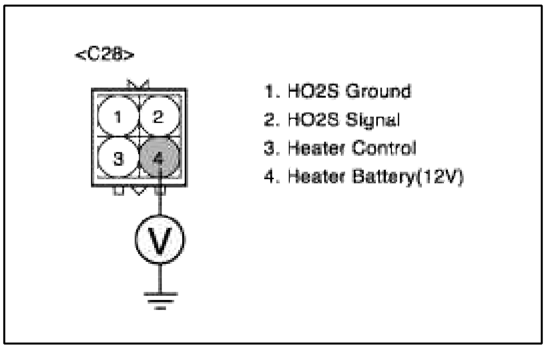
Repair as necessary and go to "Verification of vehicle Repair" procedure

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of sensor harness connector and chassis ground.


<C28>
1
2
3
4
V
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

5. Is measure voltage within Specification?

YES

Go to "Control circuit inspection" procedure.

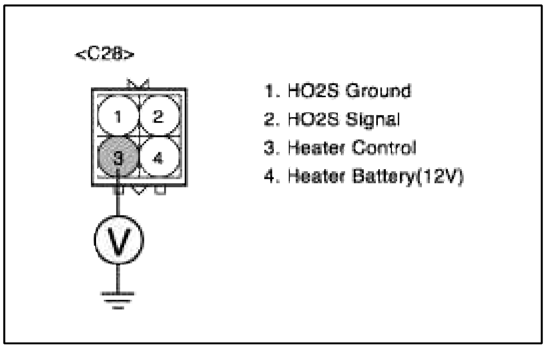
NO

Open or short circuit to chassis ground between HO2S harness connector and control relay.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when checking sensor voltage,the output voltage is 0V.
> Possible cause: Blown fuse or open circuit in harness between E/C-J/BOX and terminal 4 of HO2S heater.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of sensor harness connector.


<C28>
1
2
3
4
V
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

5. Is measure voltage within Specification?

YES

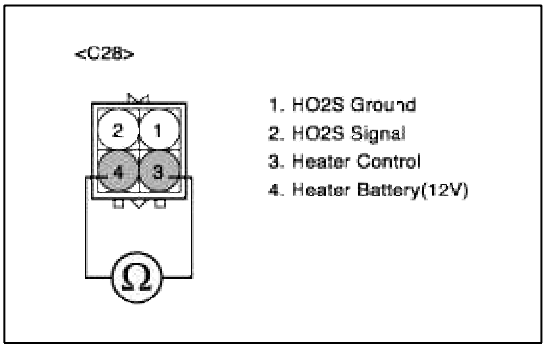
Go to "Component Inspection" procedure.

NO

Check for open or Short to ground in control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S heater
   (1) Measure resistance between terminal 3 and 4 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good HO2S heater and check for proper operation. If the problem is corrected, replace HO2S heater and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

After a repair, it is essential to verify that the fault has been corrected.

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

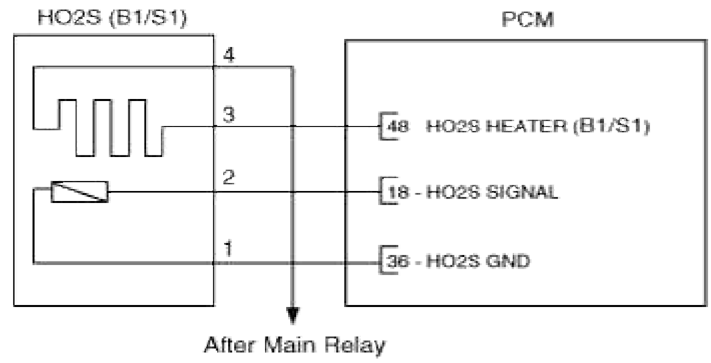
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

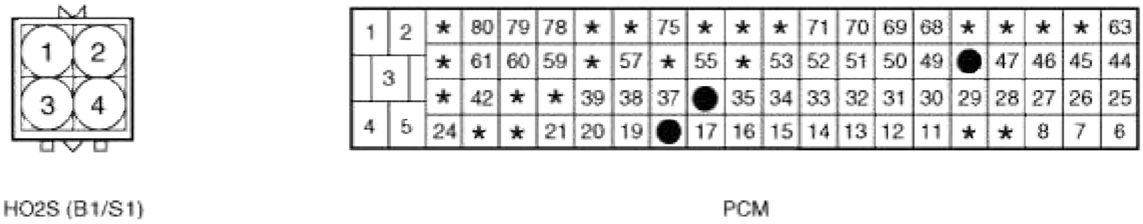
[CIRCUIT DIAGRAM]


HO2S (B1/S1)
PCM
4
3
2
1
48 HO2S HEATER (B1/S1)
18 - HO2S SIGNAL
36 - HO2S GND
After Main Relay

[CONNECTION INFORMATION]

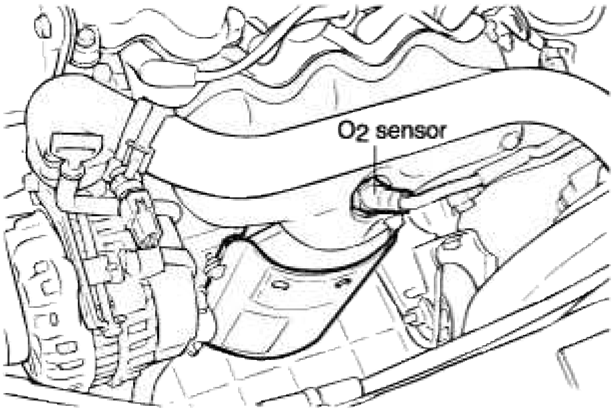
Terminal	Connected to	Function
1	PCM Terminal 36	Ground
2	PCM Terminal 18	HO2S Signal
3	PCM Terminal 48	HO2S Heater (B1/S1)
4	Main Relay	Battery Voltage

[HARNESS CONNECTORS]


1
2
3
4
HO2S (B1/S1)
PCM

Fuel System > Troubleshooting > P0032

COMPONENT LOCATION



GENERAL DESCTIPTION

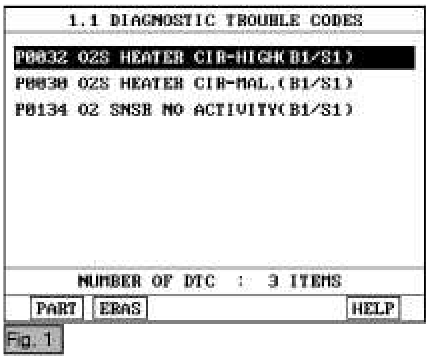
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Heater check, high	● Short to battery in control circuit ● Faulty HO2S heater ●Faulty PCM
Threshold value		
Enable Conditions	● Short circuit	
Diagnostic Time	● Continuous	
Fail Safe	● Heater open loop control	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "A/F CLOSE LOOP" parameter on the scantool.

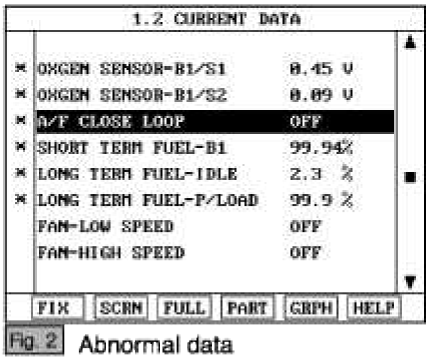


```
1.1 DIAGNOSTIC TROUBLE CODES

P0032 O2S HEATER CIR-HIGH(B1/S1)
P0030 O2S HEATER CIR-MAL.(B1/S1)
P0134 O2 SNSR NO ACTIVITY(B1/S1)

NUMBER OF DTC  :  3 ITEMS
```

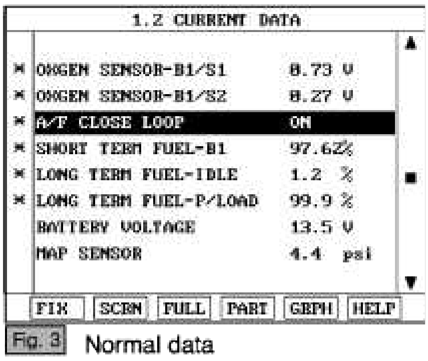
Fig. 1



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1        0.45 V
* OXGEN SENSOR-B1/S2        0.09 V
* A/F CLOSE LOOP            OFF
* SHORT TERM FUEL-B1        99.94%
* LONG TERM FUEL-IDLE       2.3  %
* LONG TERM FUEL-P/LOAD     99.9 %
  FAN-LOW SPEED             OFF
  FAN-HIGH SPEED            OFF
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1        0.73 V
* OXGEN SENSOR-B1/S2        0.27 V
* A/F CLOSE LOOP            ON
* SHORT TERM FUEL-B1        97.62%
* LONG TERM FUEL-IDLE       1.2  %
* LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.5 V
  MAP SENSOR                4.4  psi
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

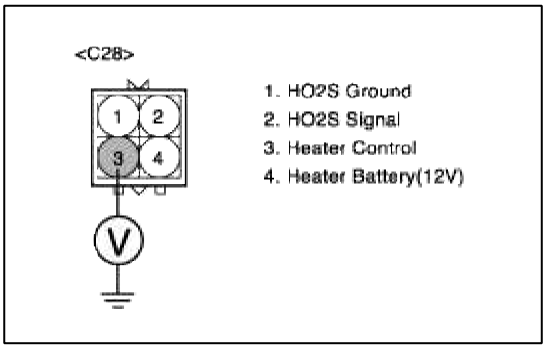
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of sensor harness connector.


<C28>
1
2
3
4
V
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

5. Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

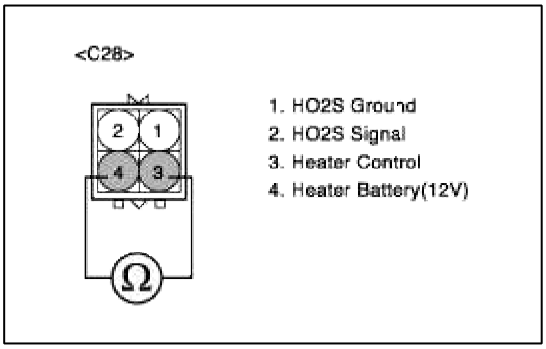
NO

Check for open or Short to ground in control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S heater

(1) Measure resistance between terminal 3 and 4 of sensor connector(To sensor side)


<C28>
2
1
4
3
Ω
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

(2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good IHO2S heater and check for proper operation. If the problem is corrected, replace HO2S heater and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.

3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

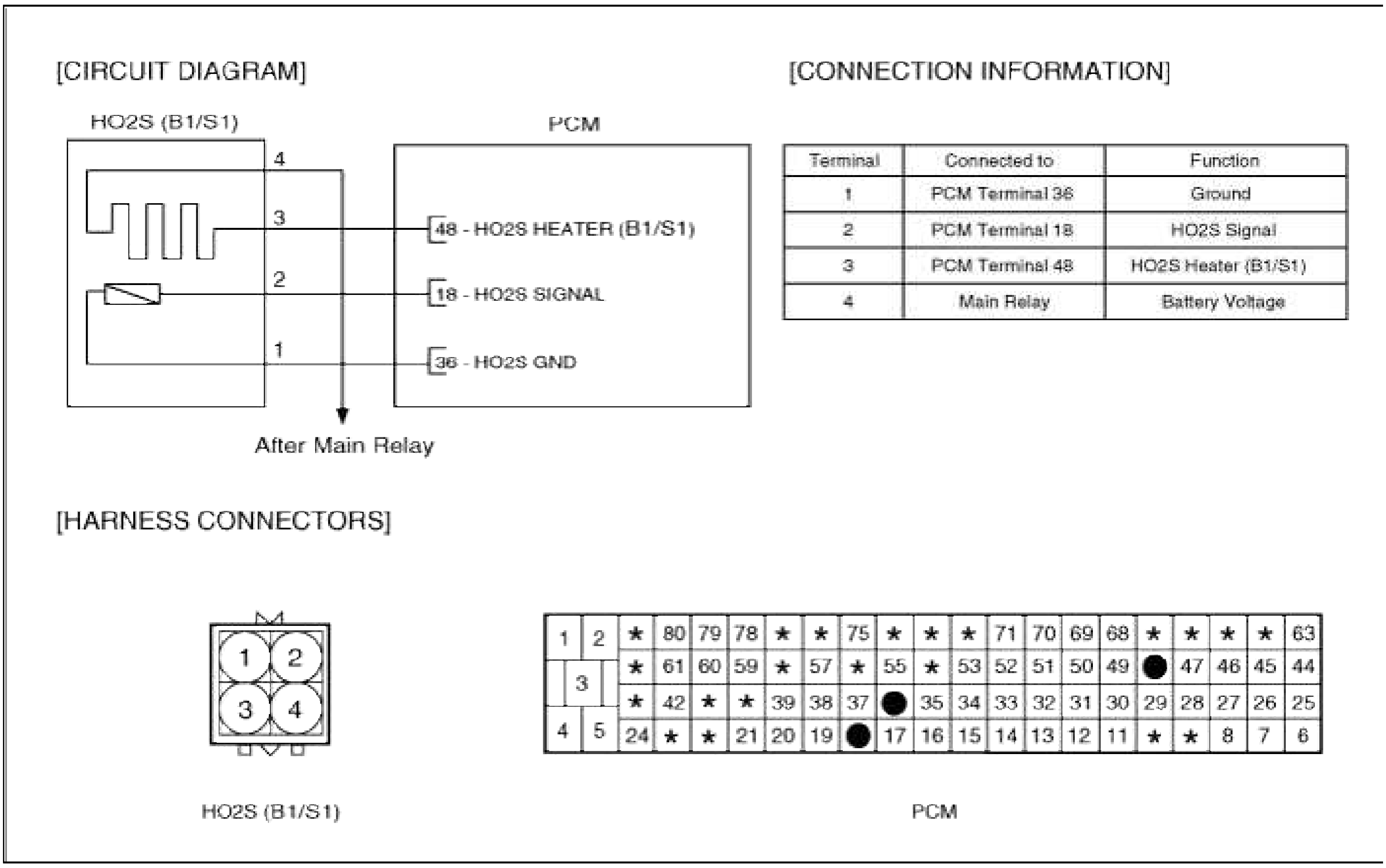
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

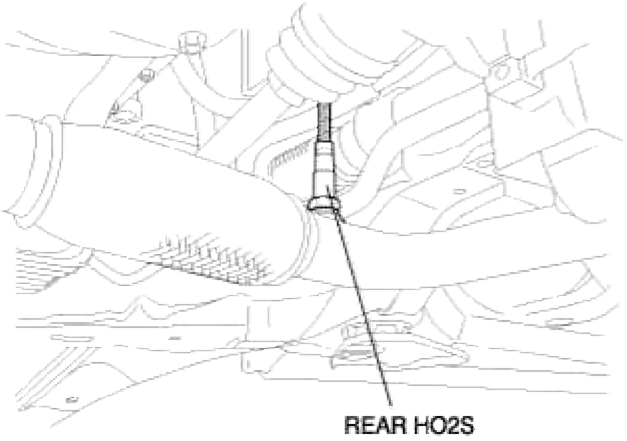

[CIRCUIT DIAGRAM]
HO2S (B1/S1)
PCM
4
3
2
1
48 - HO2S HEATER (B1/S1)
18 - HO2S SIGNAL
36 - HO2S GND
After Main Relay
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
1
2
3
4
HO2S (B1/S1)
PCM

Terminal	Connected to	Function
1	PCM Terminal 36	Ground
2	PCM Terminal 18	HO2S Signal
3	PCM Terminal 48	HO2S Heater (B1/S1)
4	Main Relay	Battery Voltage

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	●	47	46	45	44
		★	42	★	★	39	38	37	●	35	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	●	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0036

COMPONENT LOCATION



GENERAL DESCTIPTION

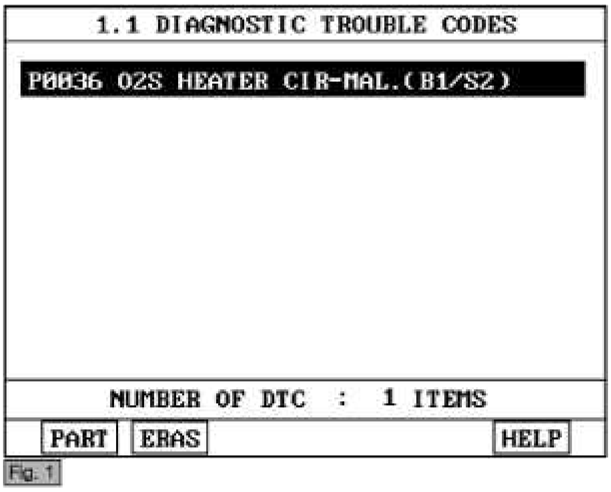
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Heater current check	● Contaminated, deteriorated or aged HO2S ● Heater resistance out of reasonable range ● Faulty HO2S heater ● Faulty PCM ● Misplaced, bent, loose or corroded terminals
Threshold value	● Internal resistance > threshold f(exh. temp.,heater power)	
Enable Conditions	● Catalyst temperature (model) 320-800 degC (608 °F~ 1472 °F) ● Dew point end detected Battery voltage 10.7-15.6 V	
Diagnostic Time	● Continuous	
Fail Safe	● Heater open loop control	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S(B1/S2) " parameter on the scantool.

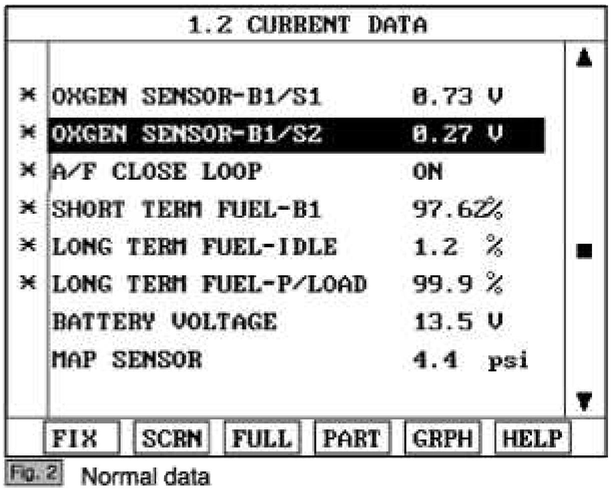


```
1.1 DIAGNOSTIC TROUBLE CODES

P0036 O2S HEATER CIR-MAL.(B1/S2)

NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1       0.73 V
* OXGEN SENSOR-B1/S2       0.27 V
* A/F CLOSE LOOP           ON
* SHORT TERM FUEL-B1       97.62%
* LONG TERM FUEL-IDLE      1.2  %
* LONG TERM FUEL-P/LOAD    99.9 %
  BATTERY VOLTAGE          13.5 V
  MAP SENSOR               4.4  psi
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

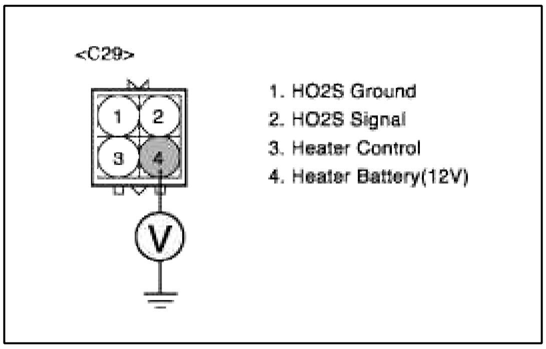
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit inspection" procedure.

NO

Open or short circuit to chassis ground between HO2S harness connector and control relay.

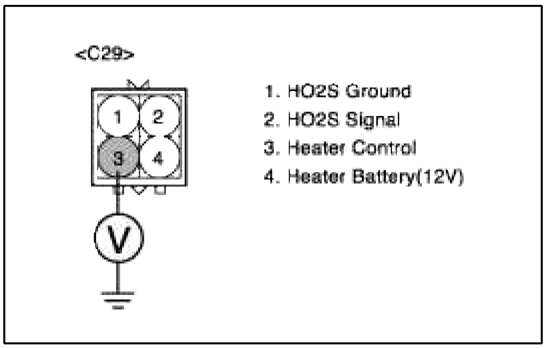
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when checking sensor voltage,the output voltage is 0V.
>
> Possible cause: Blown fuse or open circuit in harness between E/C-J/BOX and terminal 4 of HO2S heater.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 3 of sensor harness connector.



5. Is measure voltage within Specification?

YES

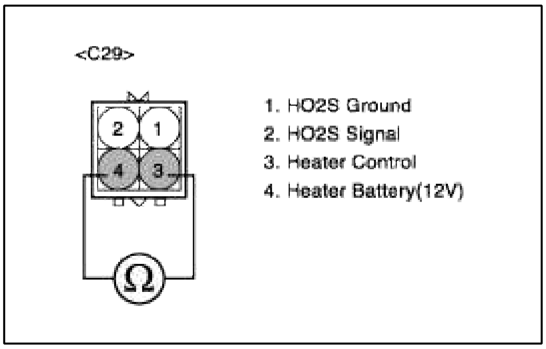
Go to "Component Inspection" procedure.

NO

Check for open or Short to ground in control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S heater
   (1) Measure resistance between terminal 3 and 4 of sensor connector(To sensor side



(2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good HO2S heater and check for proper operation. If the problem is corrected, replace HO2S heater and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

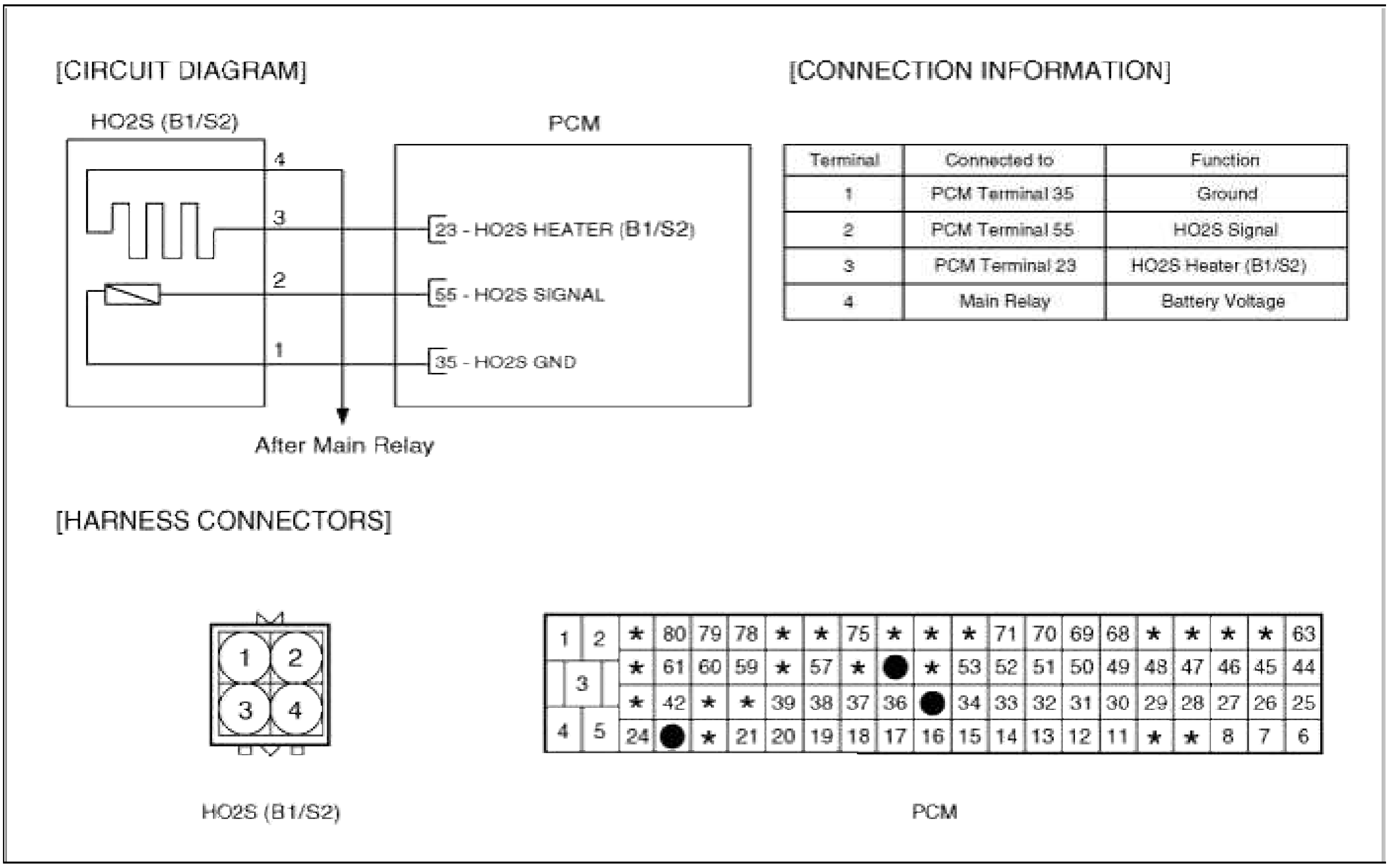
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
HO2S (B1/S2)
PCM
4
3
2
1
23 - HO2S HEATER (B1/S2)
55 - HO2S SIGNAL
35 - HO2S GND
After Main Relay
[HARNESS CONNECTORS]
1
2
3
4
HO2S (B1/S2)
PCM

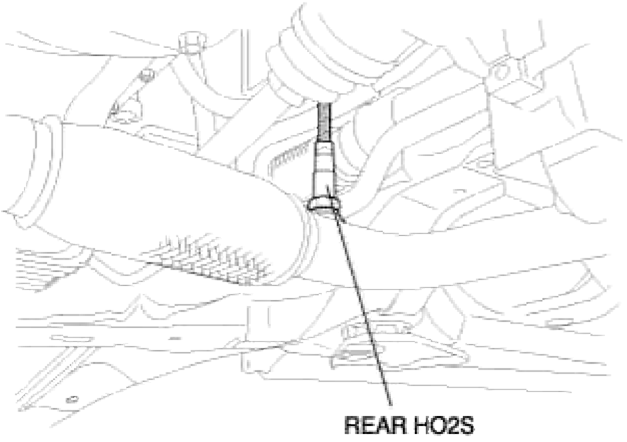
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 35	Ground
2	PCM Terminal 55	HO2S Signal
3	PCM Terminal 23	HO2S Heater (B1/S2)
4	Main Relay	Battery Voltage

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	●	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	●	34	33	32	31	30	29	28	27	26	25
4	5	24	●	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0037

COMPONENT LOCATION



GENERAL DESCTIPTION

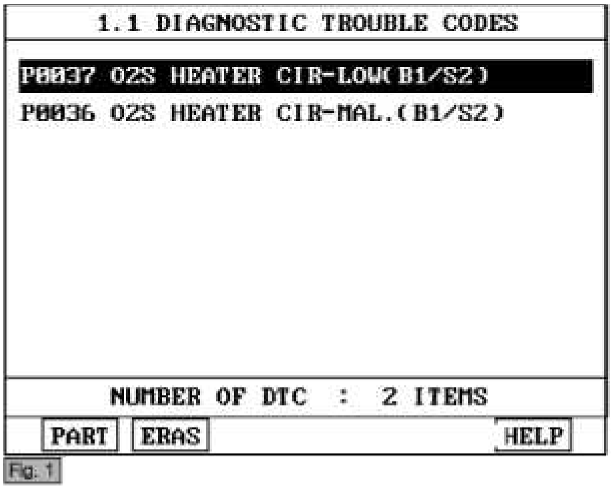
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Heater check, low	● Open in battery and control circuit ● Short to ground in control circuit (pin 28 to 35) ● Faulty HO2S heater ● Faulty PCM
Threshold value		
Enable Conditions	● Open or short circuit	
Diagnostic Time	● Continuous	
Fail Safe	● Heater open loop control	

MONITOR DTC STATUS

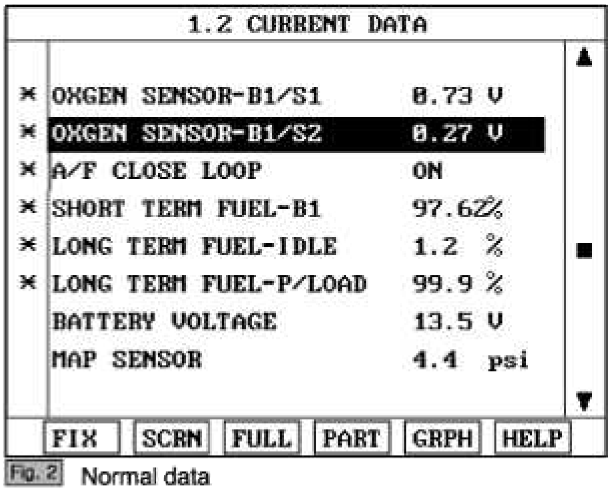
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S(B1/S2)" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0037 O2S HEATER CIR-LOW(B1/S2)
P0036 O2S HEATER CIR-MAL.(B1/S2)

NUMBER OF DTC  :  2 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
× OXGEN SENSOR-B1/S1        0.73 V
× OXGEN SENSOR-B1/S2        0.27 V
× A/F CLOSE LOOP            ON
× SHORT TERM FUEL-B1        97.62%
× LONG TERM FUEL-IDLE       1.2  %
× LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.5 V
  MAP SENSOR                4.4  psi
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

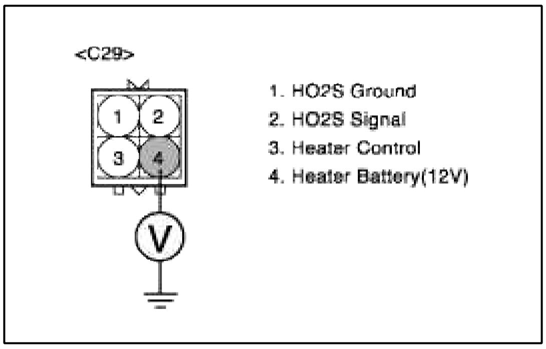
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 4 of sensor harness connector and chassis ground.


<C29>
1
2
3
4
V
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

5. Is measure voltage within Specification?

YES

Go to "Control circuit inspection" procedure.

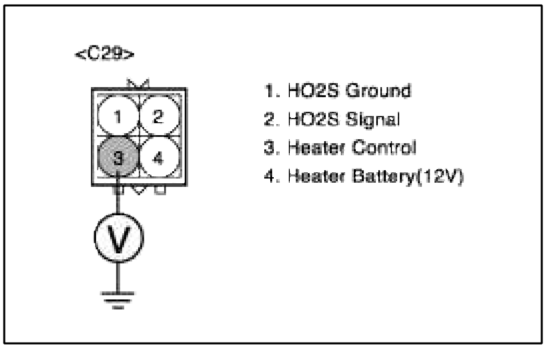
NO

Open or short circuit to chassis ground between HO2S harness connector and control relay.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of sensor harness connector.


<C29>
1
2
3
4
V
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

5. Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

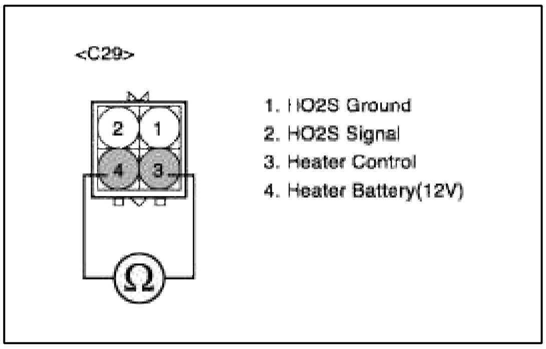
NO

Check for open or Short to ground in control circuit.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S heater
    (1) Measure resistance between terminal 3 and 4 of sensor connector(To sensor side)Specification : 80°C : 8.0~14.0Ω



    (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good HO2S heater and check for proper operation. If the problem is corrected, replace HO2S heater and then go to "Verification of Vehicle Repair" procedure.1. Check HO2S heater

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

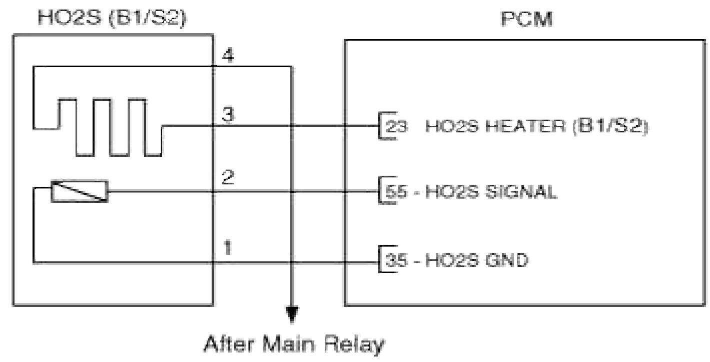
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

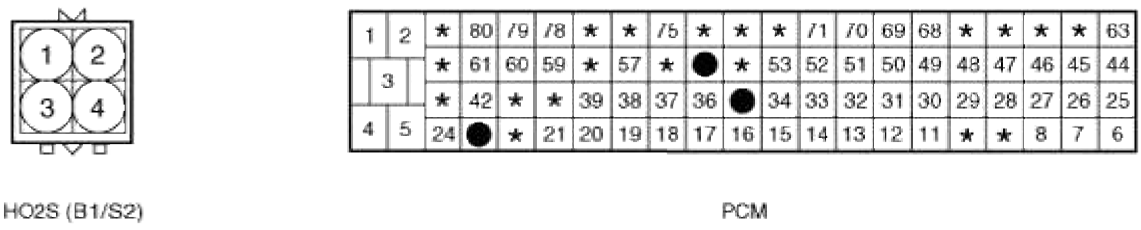
[CIRCUIT DIAGRAM]


HO2S (B1/S2)
PCM
4
3
2
1
23 HO2S HEATER (B1/S2)
55 - HO2S SIGNAL
35 - HO2S GND
After Main Relay

[CONNECTION INFORMATION]

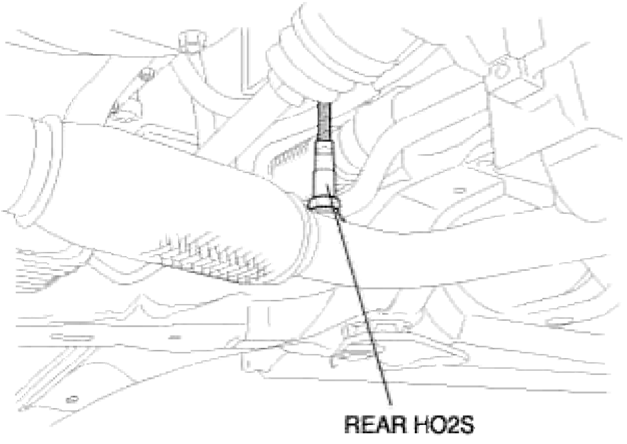
Terminal	Connected to	Function
1	PCM Terminal 35	Ground
2	PCM Terminal 55	HO2S Signal
3	PCM Terminal 23	HO2S Heater (B1/S2)
4	Main Relay	Battery Voltage

[HARNESS CONNECTORS]


1
2
3
4
HO2S (B1/S2)
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ ● ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 ● 34 33 32 31 30 29 28 27 26 25
4 5 24 ● ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P0038

COMPONENT LOCATION



GENERAL DESCTIPTION

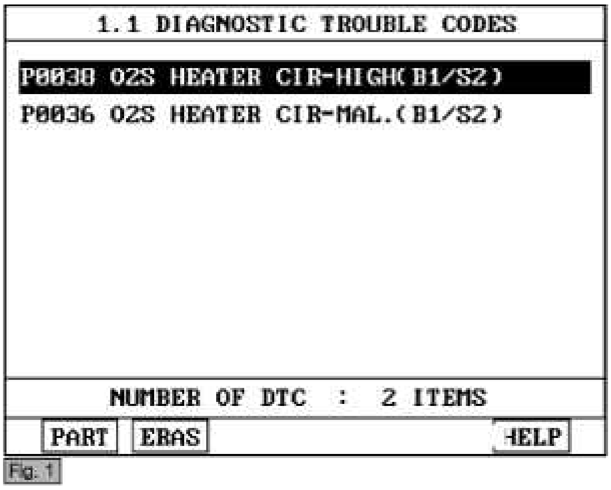
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Heater check, high	● Short to battery in control circuit ● Faulty HO2S heater ● Faulty PCM
Threshold value		
Enable Conditions	● Short circuit	
Diagnostic Time	● Continuous	
Fail Safe	● Heater open loop control	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S HTR WIRE" parameter on the scantool.

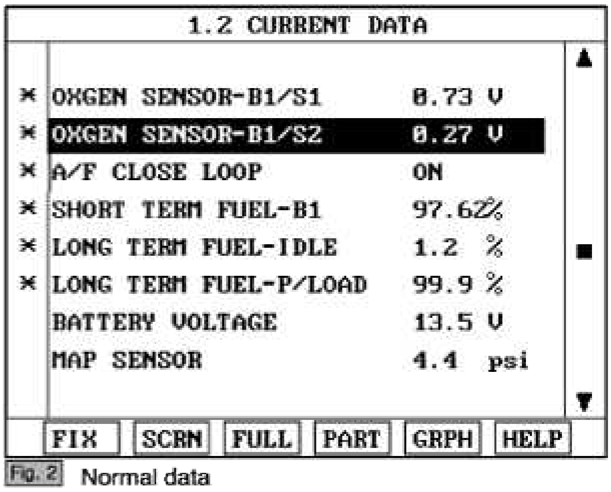


```
1.1 DIAGNOSTIC TROUBLE CODES

P0038 O2S HEATER CIR-HIGH(B1/S2)
P0036 O2S HEATER CIR-MAL.(B1/S2)

NUMBER OF DTC  :  2 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1      0.73 V
* OXGEN SENSOR-B1/S2      0.27 V
* A/F CLOSE LOOP          ON
* SHORT TERM FUEL-B1      97.6%
* LONG TERM FUEL-IDLE     1.2  %
* LONG TERM FUEL-P/LOAD   99.9 %
  BATTERY VOLTAGE         13.5 V
  MAP SENSOR              4.4  psi
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

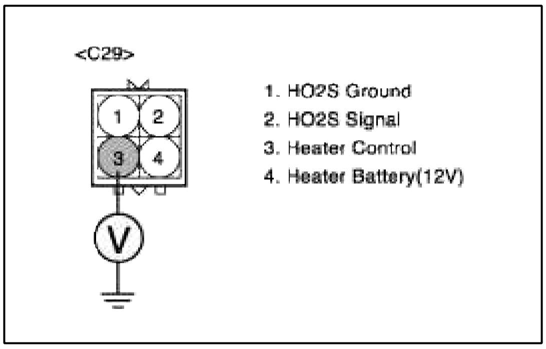
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect HO2S sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of sensor harness connector.


<C29>
1
2
3
4
V
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

5. Is measure voltage within Specification?

YES

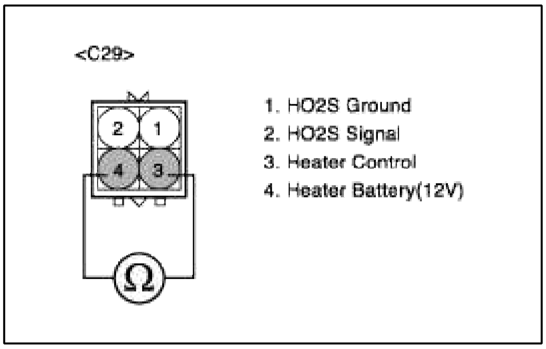
Go to "Component Inspection" procedure.

NO

Check for open or Short to ground in control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S heater
   (1) Measure resistance between terminal 3 and 4 of sensor connector(To sensor side)


<C29>
2
1
4
3
Ω
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

(2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good HO2S heater and check for proper operation. If the problem is corrected, replace HO2S heater and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.

3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

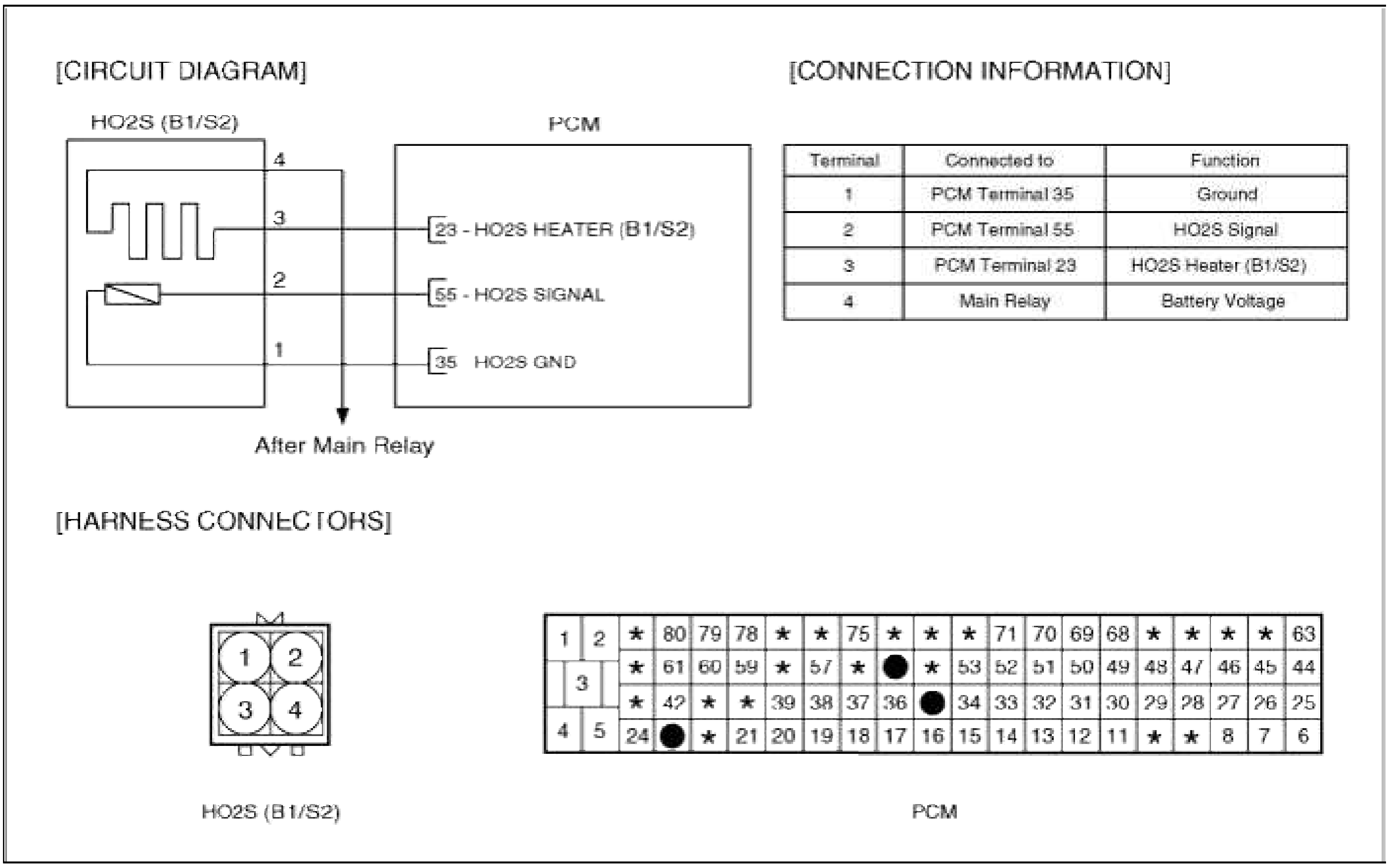
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
HO2S (B1/S2)
PCM
4
3
2
1
23 - HO2S HEATER (B1/S2)
55 - HO2S SIGNAL
35 HO2S GND
After Main Relay
[HARNESS CONNECTORS]
1
2
3
4
HO2S (B1/S2)
PCM

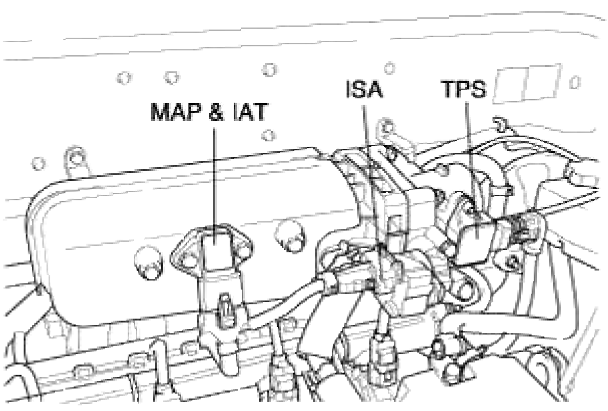
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 35	Ground
2	PCM Terminal 55	HO2S Signal
3	PCM Terminal 23	HO2S Heater (B1/S2)
4	Main Relay	Battery Voltage

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	●	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	●	34	33	32	31	30	29	28	27	26	25
4	5	24	●	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0106

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item		**Detecting Condition**	**Possible cause**
Monitoring Strategy		● Rationality check	● Poor connection of MAP sensor ● Faulty MAP sensor ● Faulty TPS ● Dirty air cleaner ● Leakage in intake system ● Contact resistance in connections. ● Faulty PCM
Case1	Threshold value	● Intake manifold pressure : > Max. Threshold or < Min. Threshold f(Eng.speed, TPS)	
	Enable Conditions	● No TPS error detected	
Case2	Threshold value	● Intake manifold pressure < 400hPa	
	Enable Conditions	● Engine speed = 0	
Case3	Threshold value	● |Intake manifold pressure - ambient pressure| < 20hPa	
	Enable Conditions	● Engine speed > 800 rpm	
Diagnostic Time		● 5 sec	
Fail Safe		● MAP value is substituted by MAP's model value. ● TPS limp home mode. ● Engine speed limitation. ● Minimum operation of EVAP control.	

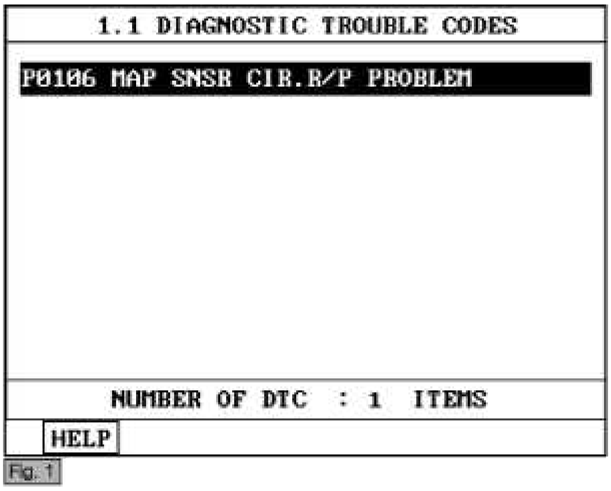
NOTE

If any codes relating to TPS are present,do all repairs associated with before proceeding this troubleshooting procedure.

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

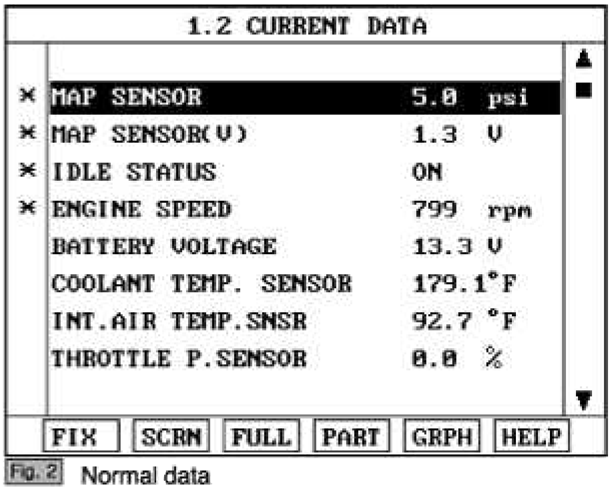
3. Monitor the "map sensor signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0106 MAP SNSR CIR.R/P PROBLEM

NUMBER OF DTC  :  1  ITEMS
```

Fig. 1



```
            1.2 CURRENT DATA
* MAP SENSOR              5.0  psi
* MAP SENSOR(V)           1.3  V
* IDLE STATUS             ON
* ENGINE SPEED            799  rpm
  BATTERY VOLTAGE         13.3 V
  COOLANT TEMP. SENSOR    179.1°F
  INT.AIR TEMP.SNSR       92.7 °F
  THROTTLE P.SENSOR       0.0  %
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.
It is normal that the output of MAP sensor changes in accordance with TPS angle.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

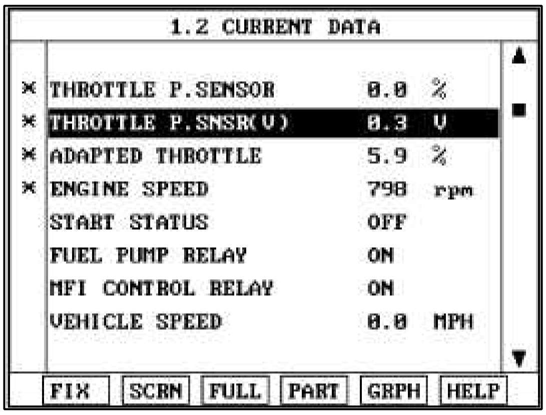
Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

MONITOR SCANTOOL DATA TPS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "TPS" parameter on the scantool.



```
            1.2 CURRENT DATA
* THROTTLE P.SENSOR       0.0  %
* THROTTLE P.SNSR(V)      0.3  V
* ADAPTED THROTTLE        5.9  %
* ENGINE SPEED            798  rpm
  START STATUS            OFF
  FUEL PUMP RELAY         ON
  MFI CONTROL RELAY       ON
  VEHICLE SPEED           0.0  MPH
```

4. Is voltege signal increase?

YES

Go to "power Circuit inspection" procedure.

NO

Temporarily install a known good TPS and check for proper operation.
If problem is corrected, replace TPS.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

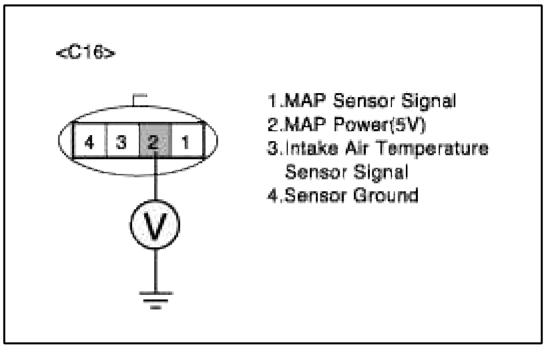
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Monitor Scantool data TPS" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect MAP sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of sensor harness connector and chassis ground.


<C16>
4
3
2
1
V
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

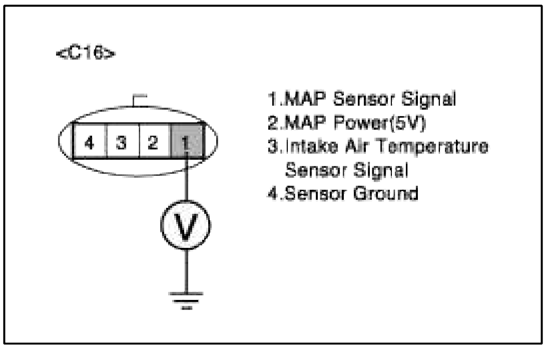
Open circuit or short circuit to chassis ground between MAP harness connector and reference voltage.
Open circuit or short circuit to chassis ground between MAP harness connector and ECM connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

In case,when MAP connector is disconnected,the voltage of MAP terminal 2 is 0 V.
Possible cause: Open or short between terminal 33 of PCM and Terminal 2 of MAP

SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect MAP sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.


<C16>
4
3
2
1
V
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

5. Is measure voltage within Specification?

YES

Go to "Component Inspection " procedure.

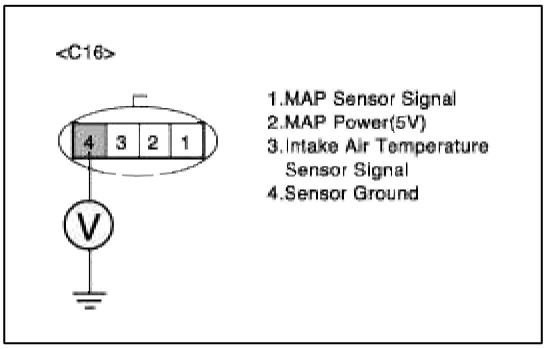
NO

Open circuit or short circuit to chassis ground between MAP harness connector and signal circuit.
Open circuit between MAP harness connector and ECM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when MAP connector is disconnected,the voltage of MAP terminal 1 is 0 V.
> Possible cause: Open or short between terminal 16 of PCM and Terminal 1 of MAP

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect MAP sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 4 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between MAP harness connector and ECM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

> **NOTE**
>
> In case,when MAP connector is disconnected,the resistance of MAP terminal 4 is infinite.
> Possible cause: Open or short between terminal 36 of PCM and Terminal 4 of MAP

COMPONENT INSPECTION

1. Air intake system inspection
    (1) Check air cleaner for dirt, blockage, or damage.
    (2) Check entire air intake system for leaks or blockages such as :
        Throttle body
        PCV valve
        Intake manifold
        Gasket beween intake manifold and surge tank
        Seals beween intake manifold and fule injectors
        Seal beween surge tank and PCV pipe
    (3) Is entire air intake system okay?

YES

Go to "Check PCM" as below.

NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure

2. Check PCM

The purpose of checking PCM is to determine whether there is any malfunction of PCM .

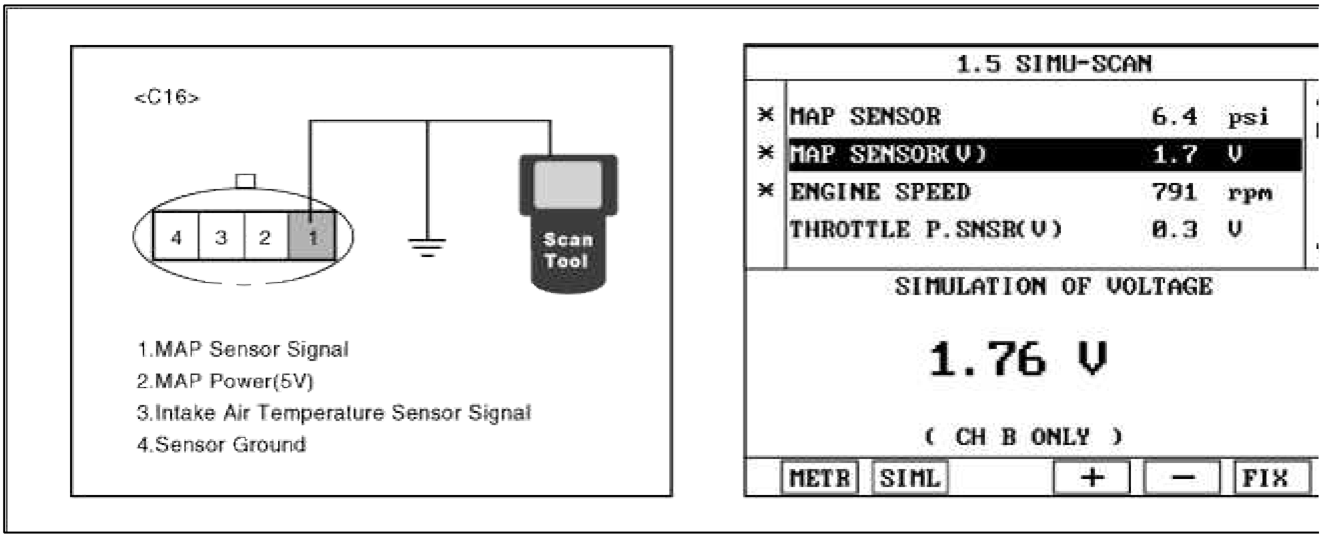
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of MAP sensor signal connector.

(5) Verify MAP voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



1.5 SIMU-SCAN

*	MAP SENSOR	6.4	psi
*	MAP SENSOR(V)	1.7	V
*	ENGINE SPEED	791	rpm
	THROTTLE P.SNSR(V)	0.3	V

SIMULATION OF VOLTAGE

1.76 V

(CH B ONLY)

(6) Is MAP sensor signal value changed according to simulation voltage ?

YES

Check MAPS for contamination, deterioration, or damage. Clean MAPS with suitable cleaner as necessar let air dry before reinstalling. If problem still exists, Substitute with a known-good MAPS and check for prope operation.

If the problem is corrected, replace MAPS and then go to "Verification of vehicle Repair" procedure

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.

3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

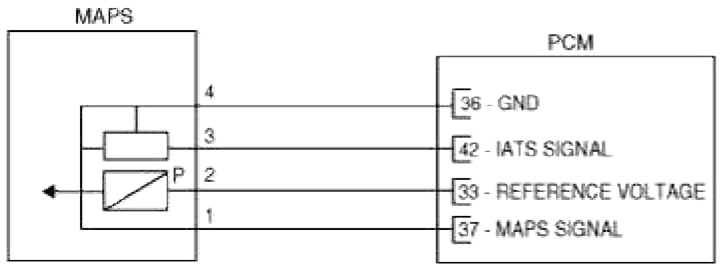
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

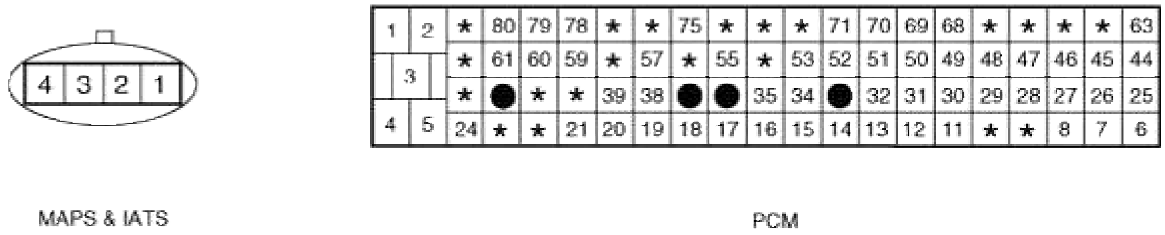
[CIRCUIT DIAGRAM]


MAPS
P
4
3
2
1
PCM
36 - GND
42 - IATS SIGNAL
33 - REFERENCE VOLTAGE
37 - MAPS SIGNAL

[CONNECTION INFORMATION]

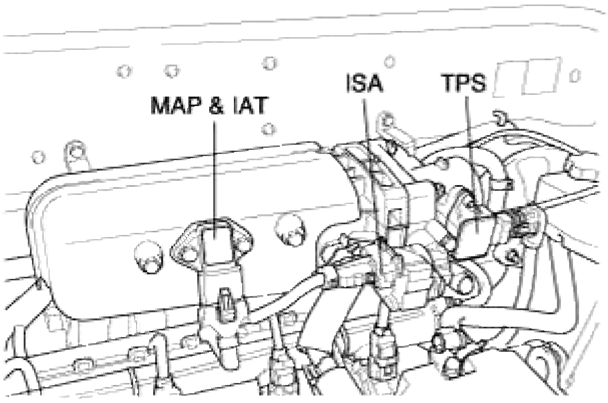
Terminal	Connected to	Function
1	PCM terminal 37	MAPS signal
2	PCM terminal 33	Reference Voltage
3	PCM terminal 42	IATS signal
4	PCM terminal 36	Sensor ground

[HARNESS CONNECTORS]


4 3 2 1
MAPS & IATS
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ ● ★ ★ 39 38 ● ● 35 34 ● 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P0107

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

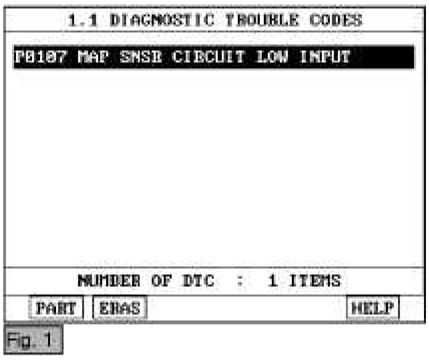
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, low	● Open in power circuit (pin 33) ● Short to ground in signal circuit (pin 36 to 37) ● Faulty MAP sensor ● Faulty PCM
Threshold value	● Sensor voltage : < 0.25V	
Enable Conditions	● Short circuit	
Diagnostic Time	● 5 sec	
Fail Safe	● MAP value is substituted by MAP's model value. ● TPS limp home mode. ● Engine speed limitation. ● Minimum operation of EVAP control.	

MONITOR DTC STATUS

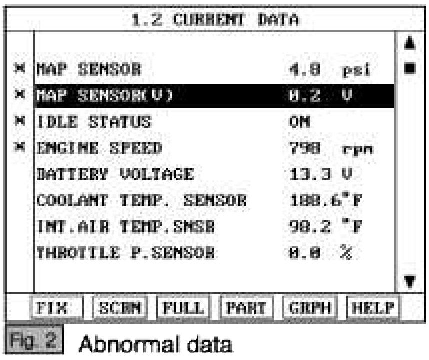
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "MAP sensor" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0107 MAP SNSR CIRCUIT LOW INPUT

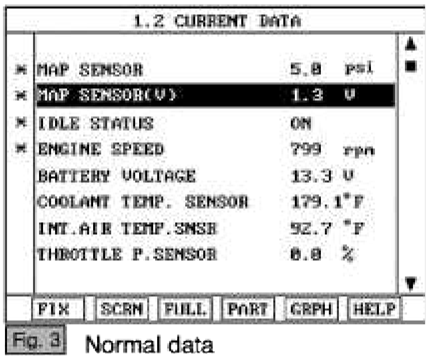
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* MAP SENSOR            4.0  psi
* MAP SENSOR(V)         0.2  V
* IDLE STATUS           ON
* ENGINE SPEED          798  rpm
  BATTERY VOLTAGE       13.3 V
  COOLANT TEMP. SENSOR  188.6°F
  INT.AIR TEMP.SNSR     98.2 °F
  THROTTLE P.SENSOR     0.0  %
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* MAP SENSOR            5.0  psi
* MAP SENSOR(V)         1.3  V
* IDLE STATUS           ON
* ENGINE SPEED          799  rpm
  BATTERY VOLTAGE       13.3 V
  COOLANT TEMP. SENSOR  179.1°F
  INT.AIR TEMP.SNSR     92.7 °F
  THROTTLE P.SENSOR     0.0  %
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.
It is normal that the output of MAP sensor changes in accordance with TPS angle.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.
Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

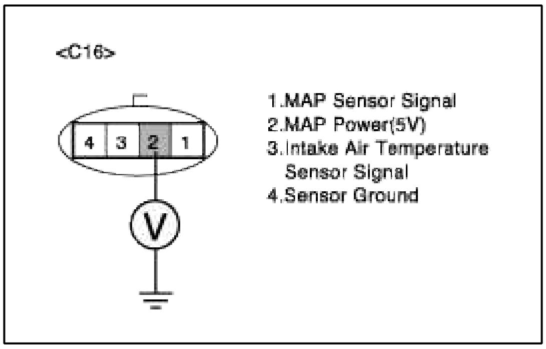
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect MAP sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

Open circuit or short circuit to chassis ground between MAP harness connector and reference voltage.
Open circuit or short circuit to chassis ground between MAP harness connector and ECM connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

1.In case,when MAP connector is disconnected,the voltage of MAP terminal 2 is 0 V.
Possible cause: Open or short between terminal 33 of PCM and Terminal 2 of MAP

SIGNAL CIRCUIT INSPECTION

1. Check for short to ground in harness

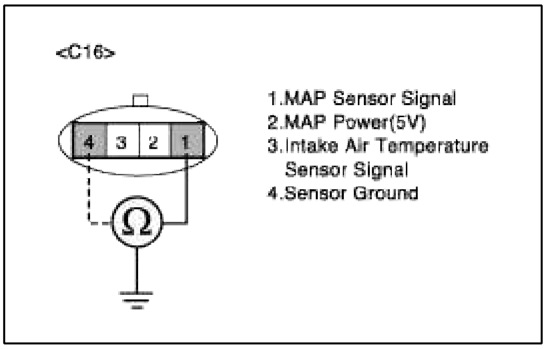
(1) Ignition "OFF"

(2) Disconnect MAP sensor connector and ECM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure resistance between terminal 1 of sensor harness connector and chassis ground.

(5) Measure resistance between terminal 1 and 4 of sensor harness connector


<C16>
4
3
2
1
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

(6) Is measure resistance within Specification?

YES

(7) Go to "Component Inspection" procedure.

NO

(8) Short circuit to chassis ground between MAP harness connector and signal circuit. Short circuit to ground between between MAP harness connector and signal circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check ECM

The purpose of checking PCM is to determine whether there is any malfunction of PCM.

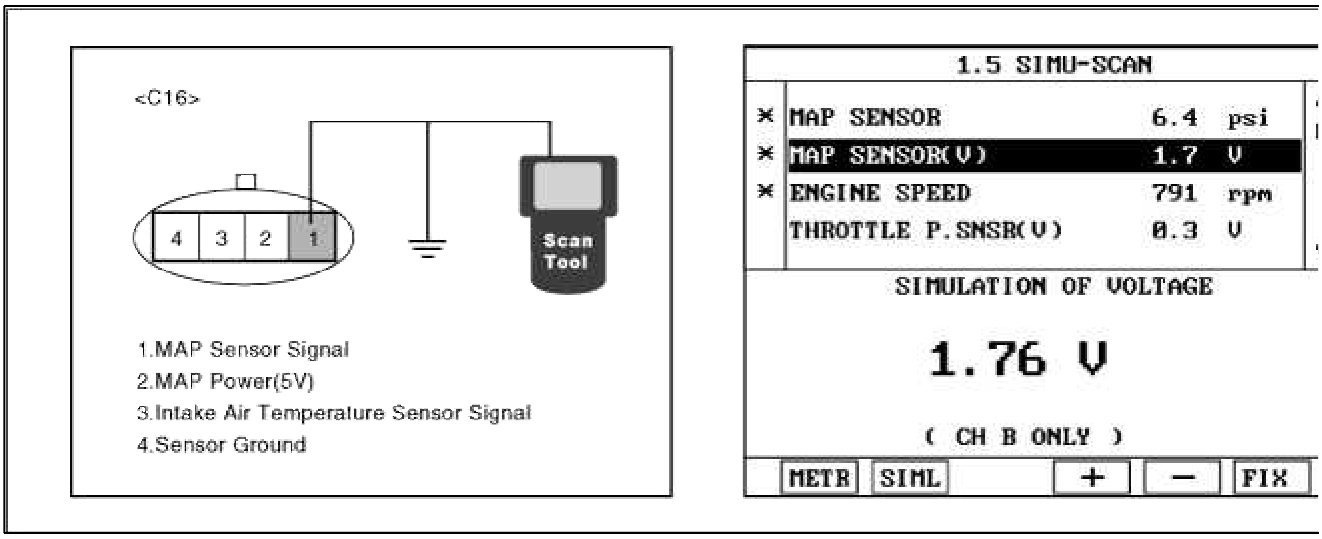
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of MAP sensor signal connector.

(5) Verify MAP voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V


<C16>
4
3
2
1
Scan Tool
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground
METR
SIML
+
−
FIX

```
1.5 SIMU-SCAN
* MAP SENSOR            6.4  psi
* MAP SENSOR(V)         1.7  V
* ENGINE SPEED          791  rpm
  THROTTLE P.SNSR(V)    0.3  V
SIMULATION OF VOLTAGE
1.76 V
( CH B ONLY )
```

(6) Is MAP sensor signal value changed according to simulation voltage ?

YES

Check MAPS for contamination, deterioration, or damage. Clean MAPS with suitable cleaner as necessary air dry before reinstalling. If problem still exists, Substitute with a known-good MAPS and check for proper operation.

If the problem is corrected, replace MAPS and then go to "Verification of vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace P and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

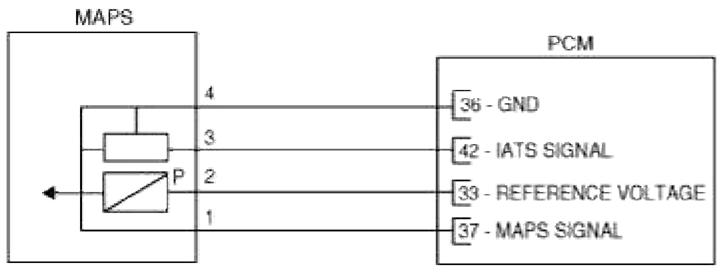
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

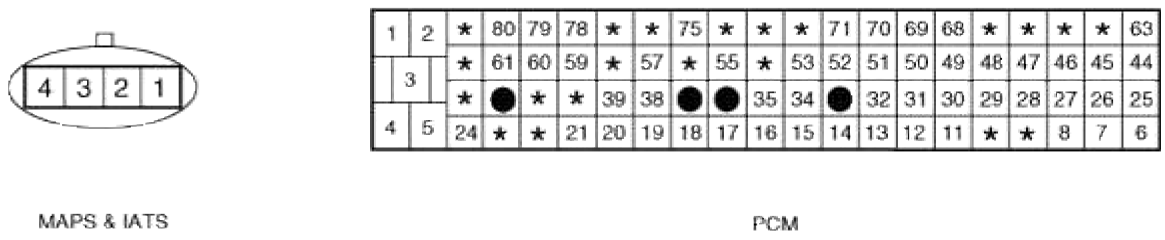
[CIRCUIT DIAGRAM]


MAPS
PCM
4
3
2
1
P
36 - GND
42 - IATS SIGNAL
33 - REFERENCE VOLTAGE
37 - MAPS SIGNAL

[CONNECTION INFORMATION]

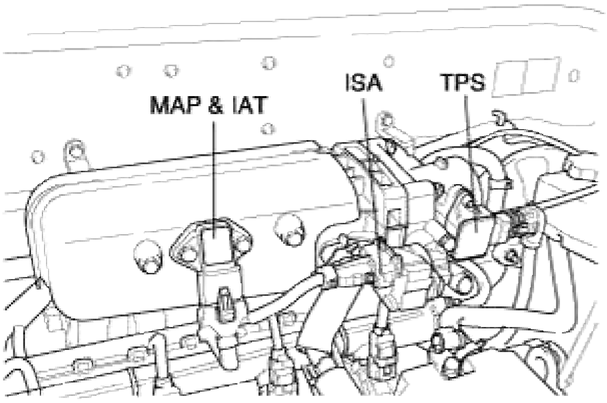
Terminal	Connected to	Function
1	PCM terminal 37	MAPS signal
2	PCM terminal 33	Reference Voltage
3	PCM terminal 42	IATS signal
4	PCM terminal 36	Sensor ground

[HARNESS CONNECTORS]


4 3 2 1
MAPS & IATS
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ ● ★ ★ 39 38 ● ● 35 34 ● 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P0108

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

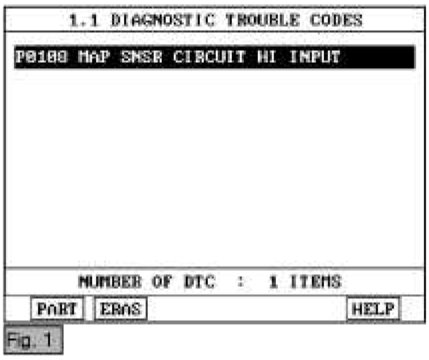
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, high	● Open in signal circuit ● Short to battery in signal circuit (pin 33 to 37) ● Open in ground circuit ● Poor connection of MAP sensor ● Faulty MAP sensor ● Faulty PCM
Threshold value	● Sensor voltage : > 4.88V	
Enable Conditions	● 1 sec after engine start	
Diagnostic Time	● 5 sec	
Fail Safe	● MAP value is substituted by MAP's model value. ● TPS limp home mode. ● Engine speed limitation. ● Minimum operation of EVAP control.	

MONITOR DTC STATUS

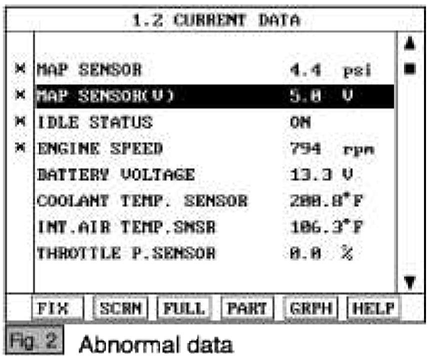
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "MAP sensor" parameter on the scantool.



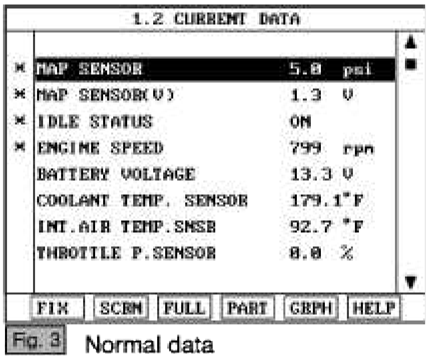
```
1.1 DIAGNOSTIC TROUBLE CODES
P0100 MAP SNSR CIRCUIT HI INPUT
NUMBER OF DTC : 1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* MAP SENSOR                4.4   psi
* MAP SENSOR(V)             5.0   V
* IDLE STATUS               ON
* ENGINE SPEED              794   rpm
  BATTERY VOLTAGE           13.3 V
  COOLANT TEMP. SENSOR      200.8°F
  INT.AIR TEMP.SNSR         106.3°F
  THROTTLE P.SENSOR         0.0  %
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* MAP SENSOR                5.0   psi
* MAP SENSOR(V)             1.3   V
* IDLE STATUS               ON
* ENGINE SPEED              799   rpm
  BATTERY VOLTAGE           13.3 V
  COOLANT TEMP. SENSOR      179.1°F
  INT.AIR TEMP.SNSR         92.7 °F
  THROTTLE P.SENSOR         0.0  %
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.
It is normal that the output of MAP sensor changes in accordance with TPS angle.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Signal circuit inspection" procedure.

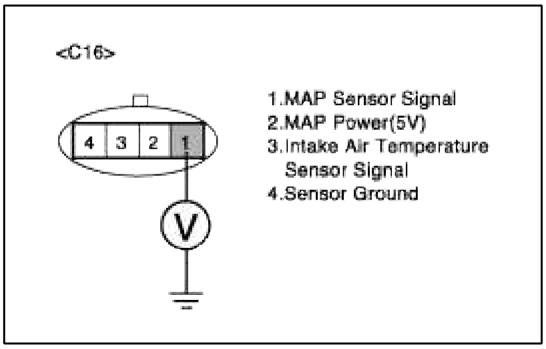
SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"

   (2) Disconnect MAP sensor connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 1 of sensor harness connector and chassis ground.


<C16>
4
3
2
1
V
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

   (5) Is measure voltage within Specification?

YES

Go to "Check for short to power in harness " as below.

NO

Open circuit or short circuit to chassis ground between MAP harness connector and signal circuit.
Open circuit between MAP harness connector and ECM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

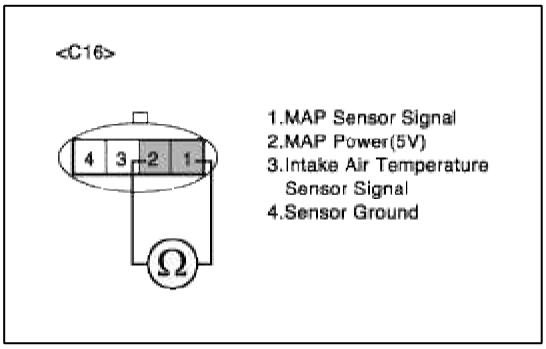
1.In case,when MAP connector is disconnected,the voltage of MAP terminal 1 is 0 V.
Possible cause: Open or short between terminal 16 of PCM and Terminal 1 of MAP

2. Check for short to power in harness
   (1) Ignition "OFF"

   (2) Disconnect MAP sensor connector and ECM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure resistance between terminal 1 and 2 of sensor harness connector.


<C16>
4
3
2
1
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

(5) Is measure resistance within Specification?

YES

Go to "Ground Circuit Inspection" procedure.

NO

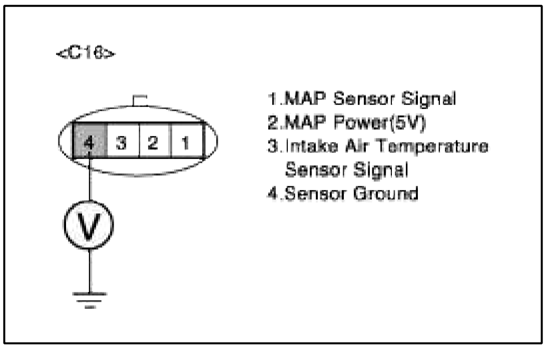
Short circuit between reference voltage(5V) circuit and signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

When the terminal 1and 2 of MAP is shorted, the resistence is below 1 ohm.

GROUND CIRUCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect MAP sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 4 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between MAP harness connector and ECM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

1.In case,when MAP connector is disconnected,the resistance of MAP terminal 4 is infinite.
Possible cause: Open or short between terminal 36 of PCM and Terminal 4 of MAP

COMPONENT INSPECTION

1. Check ECM

The purpose of checking PCM is to determine whether there is any malfunction of PCM.

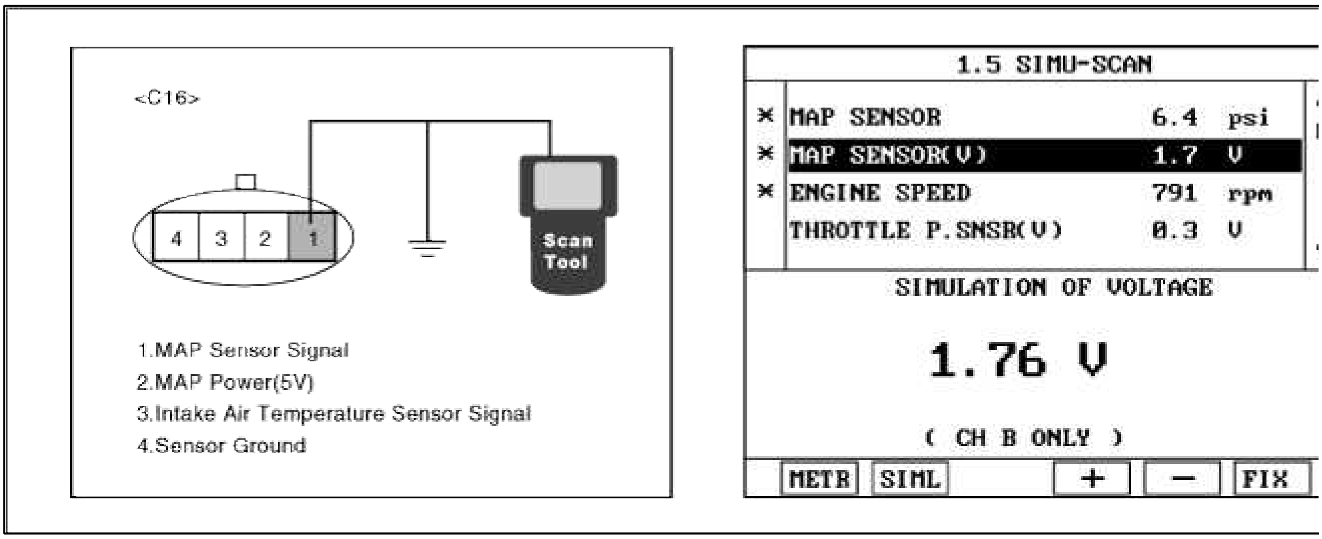
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of MAP sensor signal connector.

(5) Verify MAP voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



1.5 SIMU-SCAN

*	MAP SENSOR	6.4	psi
*	MAP SENSOR(V)	1.7	V
*	ENGINE SPEED	791	rpm
	THROTTLE P.SNSR(V)	0.3	V

SIMULATION OF VOLTAGE

1.76 V

(CH B ONLY)

(6) Is MAP sensor signal value changed according to simulation voltage ?

YES

Check MAPS for contamination, deterioration, or damage. Clean MAPS with suitable cleaner as necessar let air dry before reinstalling. If problem still exists, Substitute with a known-good MAPS and check for prope operation.

If the problem is corrected, replace MAPS and then go to "Verification of vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

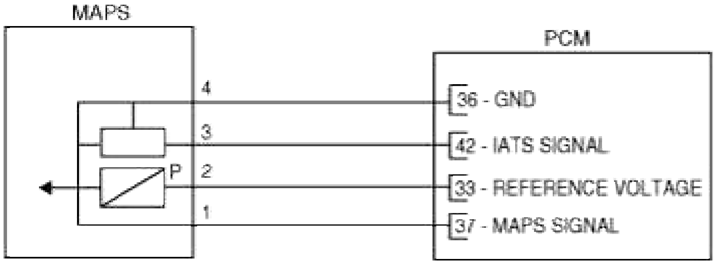
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

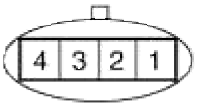
[CIRCUIT DIAGRAM]


MAPS
PCM
4
3
P
2
1
36 - GND
42 - IATS SIGNAL
33 - REFERENCE VOLTAGE
37 - MAPS SIGNAL

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM terminal 37	MAPS signal
2	PCM terminal 33	Reference Voltage
3	PCM terminal 42	IATS signal
4	PCM terminal 36	Sensor ground

[HARNESS CONNECTORS]



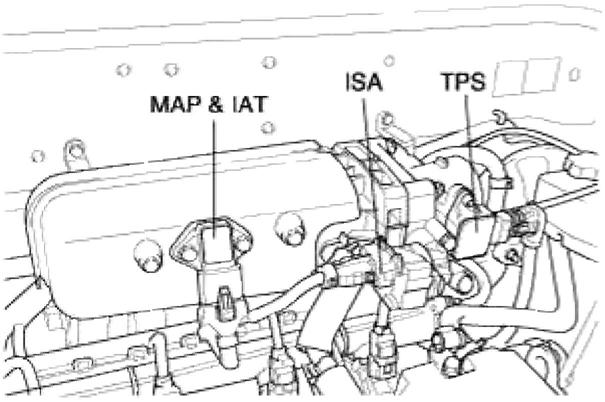
MAPS & IATS

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	●	★	★	39	38	●	●	35	34	●	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Fuel System > Troubleshooting > P0111

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

DTC DESCRIPTION

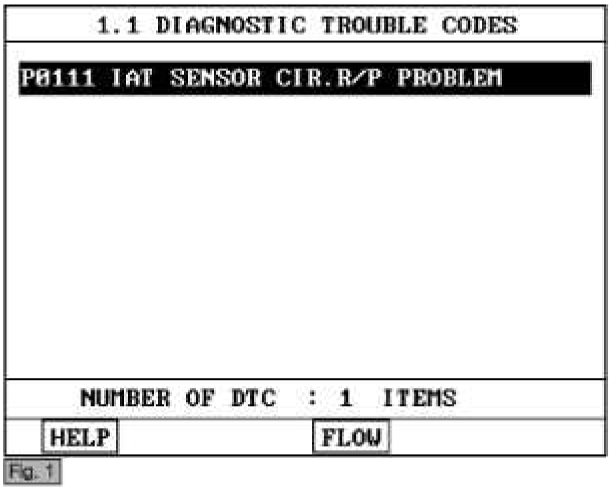
DTC DETECTING CONDITION

Item		Detecting Condition	Possible Cause
DTC Strategy		● Rationality check	● Open in signal circuit ● Short to battery in signal circuit (Supply 4.8V to pin 42) ● Open in ground circuit ● Short to ground in signal circuit (Supply 1V to pin 42) ● Faulty IATS ● Faulty PCM ● Poor connections between IATS and ECM ● Misplaced,bent,loose or corroded terminals.
case1	Enable Conditions	● Engine start temperature < 30°C(86°F)	
		● Idle condition Enable	
		● Vehicle speed < 10km/h(6.2137mph)	
		● Coolant temperature > 75°C(167°F)	
	Threshold Value	● Max. temp - min. temp(A stuck sensor signal)<=2.25°C(36.05°F)	
	Diagnostic Time	● 1 times 45 sec continuous	
case2	Enable Conditions	● No idle and no fuel cut-off	
		● Vehicle speed > 50 kph(31.06856 mile)	
		● Air mass > 40kg/h	
	Threshold Value	● Max. temp - min. temp(A stuck sensor signal)<=2.25°C(36.05°F)	
	Diagnostic Time	● 1 times 60 sec continuous	
case3	Enable Conditions	● 240 sec after engine start	
	Threshold Value	● Intake air temperature < -30 degC(-22 °F)	
	Diagnostic Time	● 15 sec	
case4	Enable Conditions	● Idle and no fuel cut-off	
	Threshold Value	● Engine coolant temperature > 75°C(167°F)	
	Diagnostic Time	● 15 sec	
case5	Enable Conditions	● Last soak time > 5hrs	
		● Engine on-time < 40sec	
		● Vehicle speed > 10 kph(6.213712 mile)	
	Threshold Value	● Intake temp. - Coolant temp > 10 degC(50 °F)	
	Diagnostic Time	● 2 sec	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "IATS signal" parameter on the scantool.

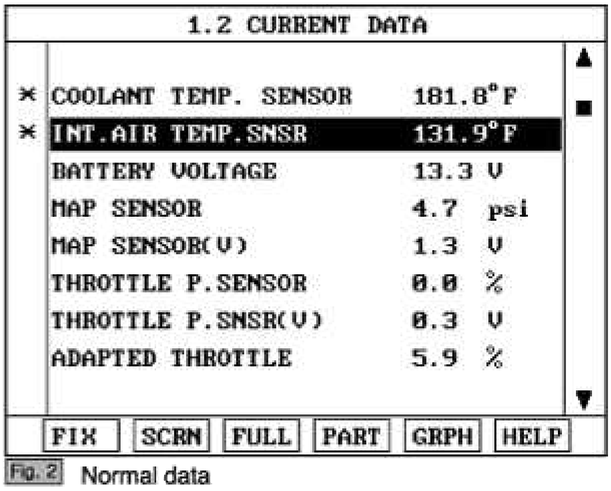


```
1.1 DIAGNOSTIC TROUBLE CODES

P0111 IAT SENSOR CIR.R/P PROBLEM

NUMBER OF DTC  :  1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* COOLANT TEMP. SENSOR      181.8°F
* INT.AIR TEMP.SNSR         131.9°F
  BATTERY VOLTAGE           13.3 V
  MAP SENSOR                4.7  psi
  MAP SENSOR(V)             1.3  V
  THROTTLE P.SENSOR         0.0  %
  THROTTLE P.SNSR(V)        0.3  V
  ADAPTED THROTTLE          5.9  %
```

Fig. 2 Normal data

NOTE

If the output voltage moves in reverse direction while air temperature changes,the IAT sensor is normal. When IAT sensor is in malfunction, the default value for IAT is 20.3°C.

Service standard
0°C (32°F) : 4.0~4.4 V
20°C(68°F) : 3.3~3.7 V
40°C(104°F) : 2.5~2.9 V
80°C(176°F) : 1.0~1.4 V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

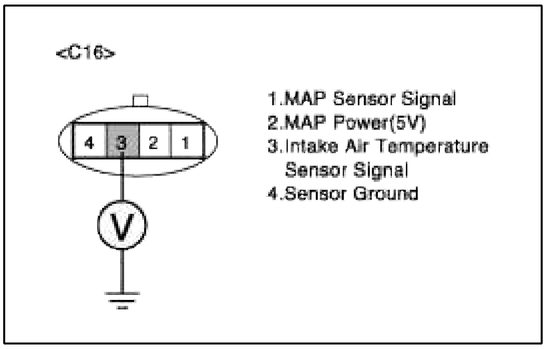
1. Check for open in harness

(1) Ignition "OFF"

(2) Disconnect IAT sensor connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure voltage between terminal 3 of sensor harness connector and chassis ground.


<C16>
4
3
2
1
V
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

(5) Is measure voltage within Specification?

YES

Go to "Check for short to power in harness " as below.

NO

In case over 5V : Short circuit to battery between IATS harness connector and PCM harness connector.
In case 0V : Open or short circuit between IATS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

1.In case,when IATS connector is disconnected,the voltage of IATS terminal 3 is 0 V.
Possible cause: Open or short between terminal 42 of PCM and Terminal 3 of IATS

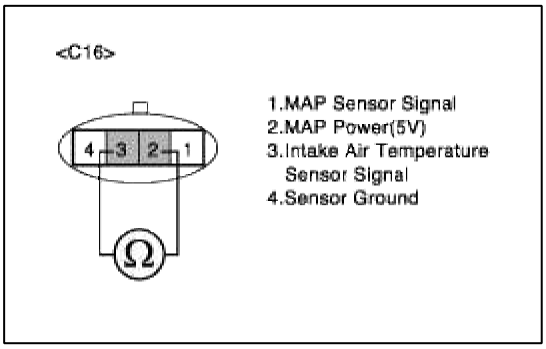
2. Check for short to power in harness

(1) Ignition "OFF"

(2) Disconnect IAT sensor connector and ECM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure resistance between terminal 2 and 3 of sensor harness connector.


<C16>
4
3
2
1
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

(5) Is measure resistance within Specification?

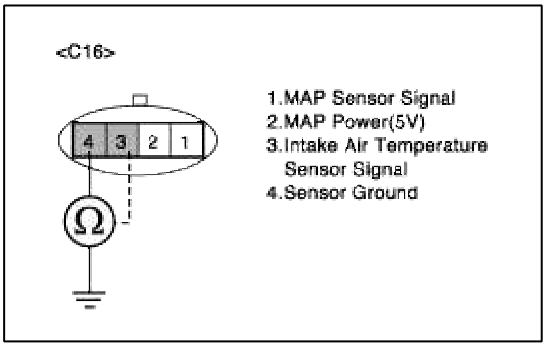
YES

Go to "Check for short to ground in harness" as below.

NO

Short circuit between MAP sensor power circuit and IATS signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

3. Check for short to ground in harness
    (1) Ignition "OFF"
    (2) Disconnect IAT sensor connector and ECM connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure resistance between terminal 4 of sensor harness connector and chassis ground.
    (5) Measure resistance between terminal 3 and 4 of sensor harness connector


<C16>
4
3
2
1
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

    (6) Is measure resistance within Specification?

YES

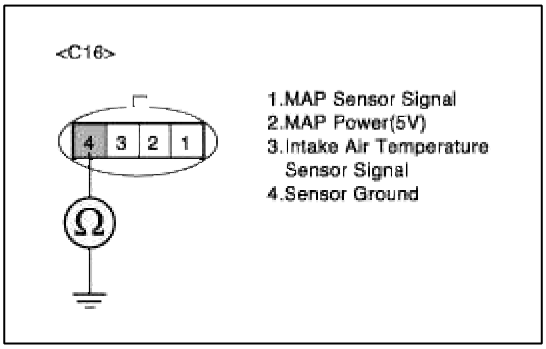
Go to "Ground Circuit Inspection" procedure.

NO

Short circuit between IATS signal circuit and ground circuit.
Short chassis ground between IATS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect IAT sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 4 of sensor harness connector and chassis ground.


<C16>
4
3
2
1
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between IATS harness connector and PCM harness connector.
Open circuit between PCM harness connector and chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

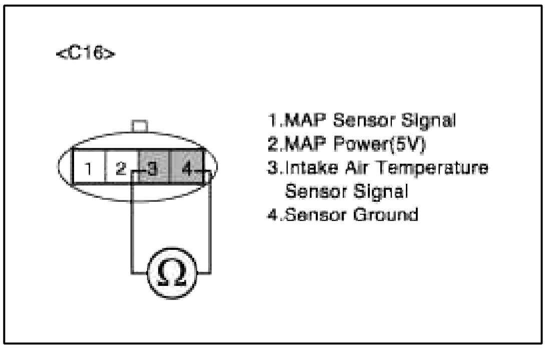
In case,when checking open ground circuit,the resistence is infinite.
Possible cause: Open or short between terminal 36 of PCM and Terminal 4 of IATS.

COMPONENT INSPECTION

1. Check IATS

Measuring the resistence of IAT sensor is to find whether the open circuit exists in the sensor’s inner side.

(1) Measure resistance between terminal 3 and 4 of sensor connector(To sensor side)


<C16>
1 2 3 4
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

(2) Does each resistance indicate continuity circuit?

YES

Go to "Check PCM" as below.

NO

Open circuit IATS .

Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

The purpose to measure IAT resistence is to decide where open circuit exists and the method is to check continuity between IAT signal line and ground line.

2. Check PCM

The purpose of checking PCM is to determine whether there is any malfunction of PCM .

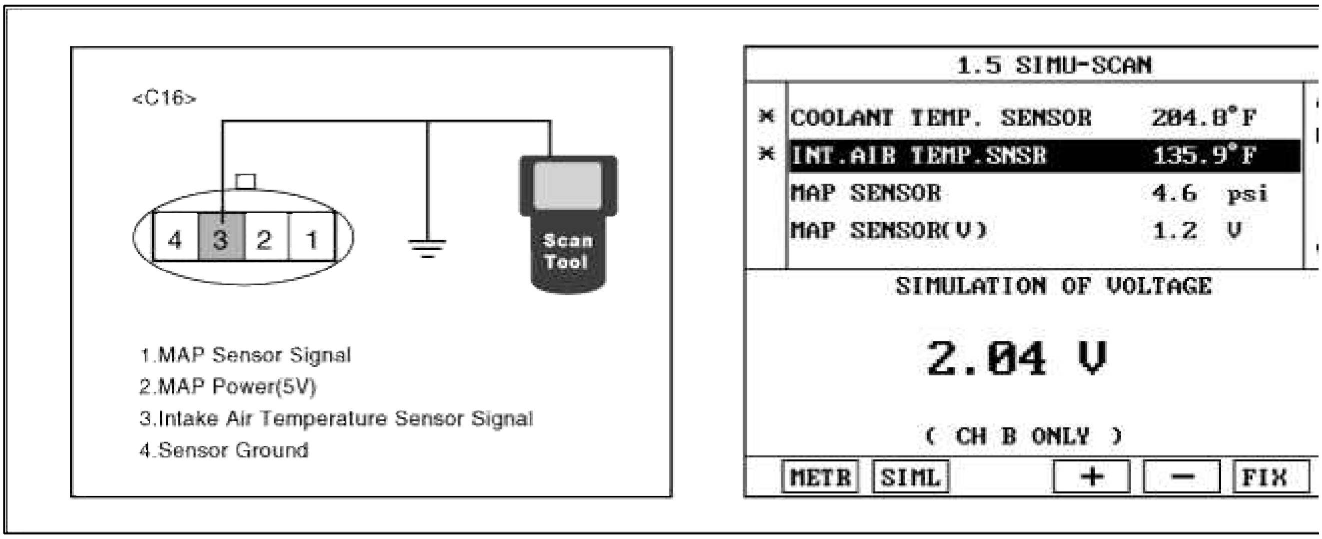
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 3 of IAT sensor signal connector.

(5) Verify IATS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V


<C16>
4 3 2 1
Scan Tool
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground
METR
SIML
+
−
FIX

```
1.5 SIMU-SCAN
× COOLANT TEMP. SENSOR    204.8°F
× INT.AIR TEMP.SNSR       135.9°F
  MAP SENSOR              4.6   psi
  MAP SENSOR(V)           1.2   V
     SIMULATION OF VOLTAGE
          2.04 V
        ( CH B ONLY )
```

(6) Is IAT sensor signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

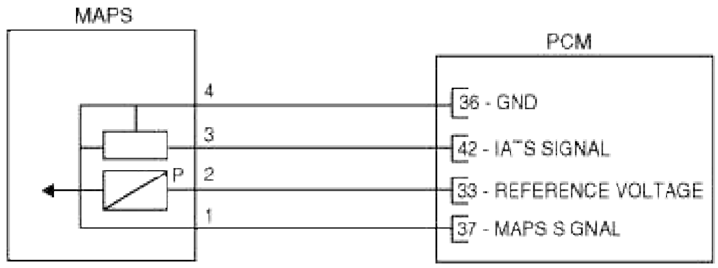
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

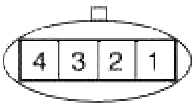
[CIRCUIT DIAGRAM]



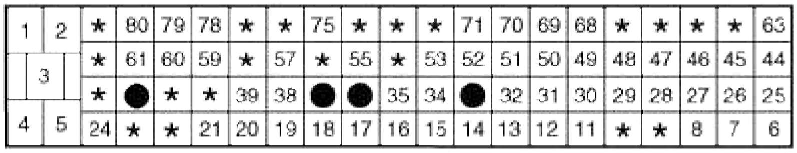
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM terminal 37	MAPS signal
2	PCM terminal 33	Reference Voltage
3	PCM terminal 42	IATS signal
4	PCM terminal 36	Sensor ground

[HARNESS CONNECTORS]



MAPS & IATS

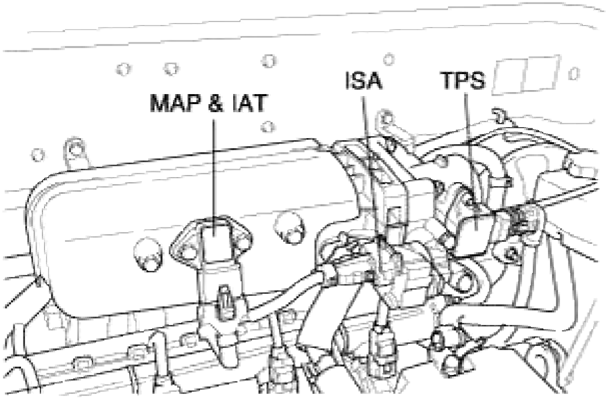


1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	●	★	★	39	38	●	●	35	34	●	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Fuel System > Troubleshooting > P0112

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

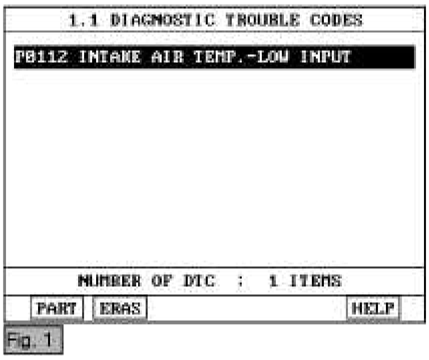
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, low	● Open in signal circuit ● Short to battery in signal circuit (pin 42 to 33) ● Open in ground circuit ● Faulty IATS ● Faulty PCM
Threshold value	● Measured temperature : < -38.25°C(-36.85°F)	
Enable Conditions	● Idle and no fuel cut-off ● 240 sec after engine start	
Diagnostic Time	● 10.2 sec	
Fail Safe	● No failurre detected on ECTS - The limp home value of IATS depends on ECTS. ● Failure detected on ECTS - PCM controls with mapping data.	

MONITOR DTC STATUS

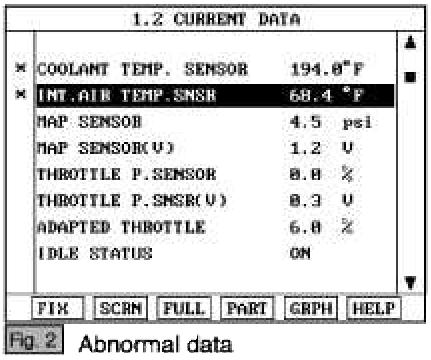
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "IATS signal" parameter on the scantool.



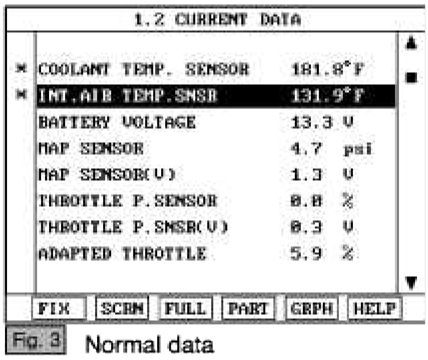
```
1.1 DIAGNOSTIC TROUBLE CODES
P0112 INTAKE AIR TEMP.-LOW INPUT
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* COOLANT TEMP. SENSOR    194.0°F
* INT.AIR TEMP.SNSR       68.4 °F
  MAP SENSOR              4.5  psi
  MAP SENSOR(V)           1.2  V
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SNSR(V)      0.3  V
  ADAPTED THROTTLE        6.0  %
  IDLE STATUS             ON
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* COOLANT TEMP. SENSOR    181.8°F
* INT.AIR TEMP.SNSR       131.9°F
  BATTERY VOLTAGE         13.3 V
  MAP SENSOR              4.7  psi
  MAP SENSOR(V)           1.3  V
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SNSR(V)      0.3  V
  ADAPTED THROTTLE        5.9  %
```

Fig. 3 Normal data

NOTE

If the output voltage moves in reverse direction while air temperature changes,the IAT sensor is normal.
When IAT sensor is in malfunction, the default value for IAT is 20.3°C.

Service standard
0°C (32°F) : 4.0~4.4 V
20°C(68°F) : 3.3~3.7 V
40°C(104°F) : 2.5~2.9 V
80°C(176°F) : 1.0~1.4 V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

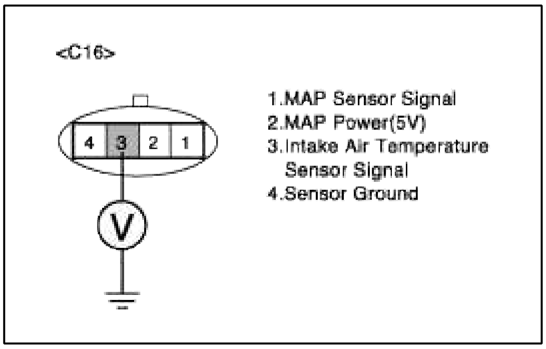
1. Check for open in harness

   (1) Ignition "OFF"

   (2) Disconnect IAT sensor connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 3 of sensor harness connector and chassis ground.


<C16>
4
3
2
1
V
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

   (5) Is measure voltage within Specification?

YES

Go to "Check for short to power in harness " as below.

NO

In case over 5V : Short circuit to battery between IATS harness connector and PCM harness connector.
In case 0V : Open or short circuit between IATS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

> NOTE
>
> 1.In case,when IATS connector is disconnected,the voltage of IATS terminal 3 is 0 V.
> Possible cause: Open or short between terminal 42 of PCM and Terminal 3 of IATS

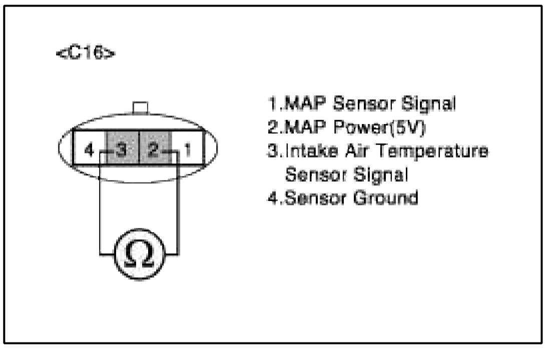
2. Check for short to power in harness

   (1) Ignition "OFF"

   (2) Disconnect IAT sensor connector and ECM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure resistance between terminal 2 and 3 of sensor harness connector.


<C16>
4
3
2
1
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

   (5) Is measure resistance within Specification?

YES

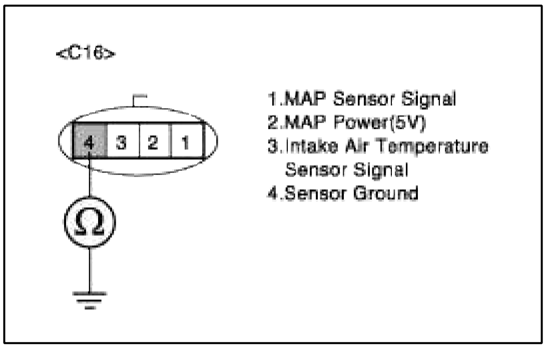
Go to "Check for short to ground in harness" as below.

NO

Short circuit between MAP sensor power circuit and IATS signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect IAT sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 4 of sensor harness connector and chassis ground.


<C16>
4
3
2
1
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between IATS harness connector and PCM harness connector.
Open circuit between PCM harness connector and chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

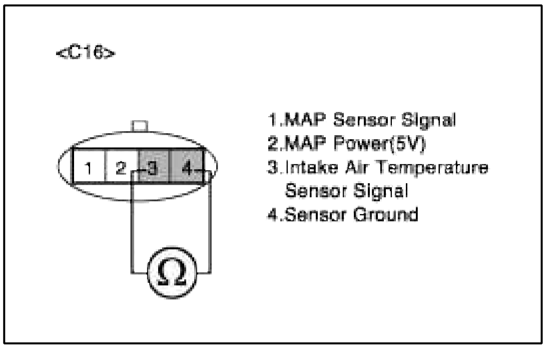
In case,when checking open ground circuit,the resistence is infinite.
Possible cause: Open or short between terminal 36 of PCM and Terminal 4 of IATS.

COMPONENT INSPECTION

1. Check IATS

Measuring the resistence of IAT sensor is to find whether the open circuit exists in the sensor's inner side.

(1) Measure resistance between terminal 3 and 4 of sensor connector(To sensor side)


<C16>
1
2
3
4
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

(2) Does each resistance indicate continuity circuit?

YES

Go to "Check PCM" as below.

NO

Open circuit IATS .

Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

The purpose to measure IAT resistence is to decide where open circuit exists and the method is to check continuity between IAT signal line and ground line.

2. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of PCM .

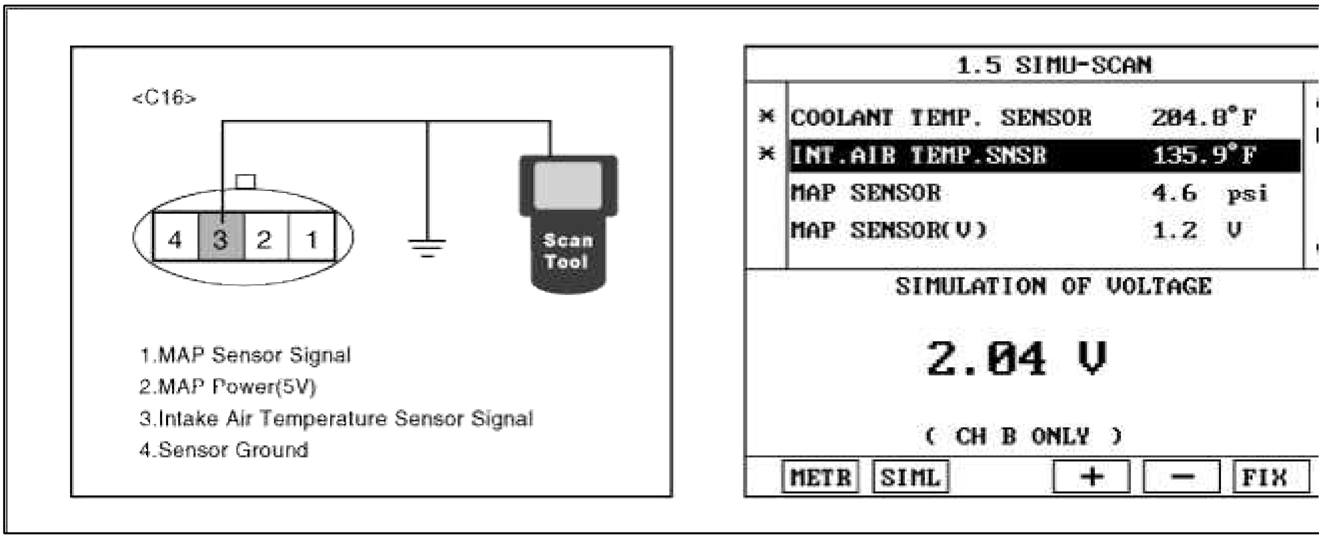
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 3 of IAT sensor signal connector.

(5) Verify IATS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



```
1.5 SIMU-SCAN
× COOLANT TEMP. SENSOR    204.8°F
× INT.AIR TEMP.SNSR       135.9°F
  MAP SENSOR              4.6  psi
  MAP SENSOR(V)           1.2  V
SIMULATION OF VOLTAGE
2.04 V
( CH B ONLY )
METR  SIML        +    −    FIX
```

(6) Is IAT sensor signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace F and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

YES

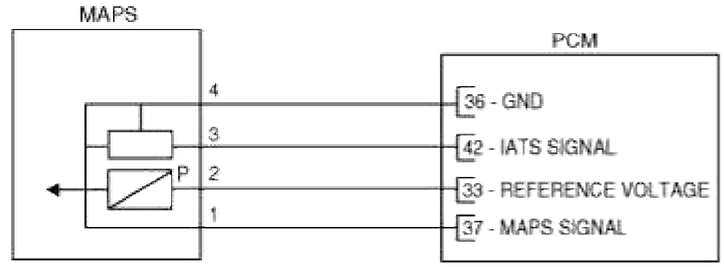
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

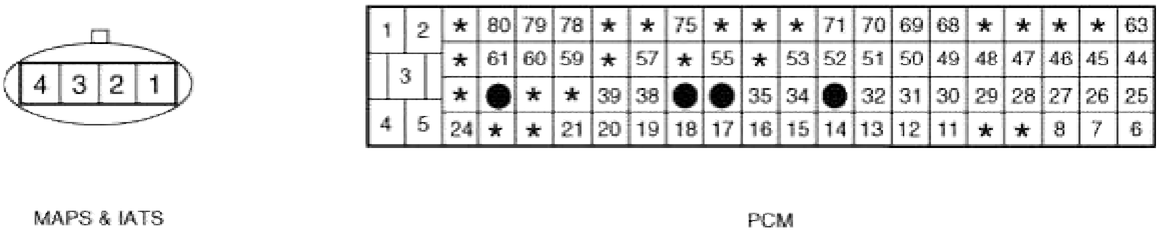
[CIRCUIT DIAGRAM]


MAPS
PCM
4
3
2
1
P
36 - GND
42 - IATS SIGNAL
33 - REFERENCE VOLTAGE
37 - MAPS SIGNAL

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM terminal 37	MAPS signal
2	PCM terminal 33	Reference Voltage
3	PCM terminal 42	IATS signal
4	PCM terminal 36	Sensor ground

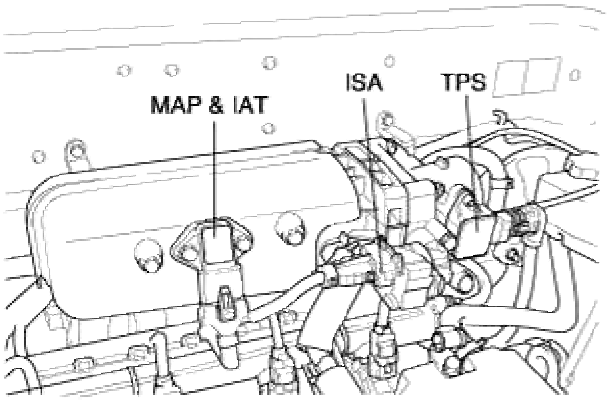
[HARNESS CONNECTORS]


4
3
2
1
MAPS & IATS
PCM

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	●	★	★	39	38	●	●	35	34	●	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0113

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

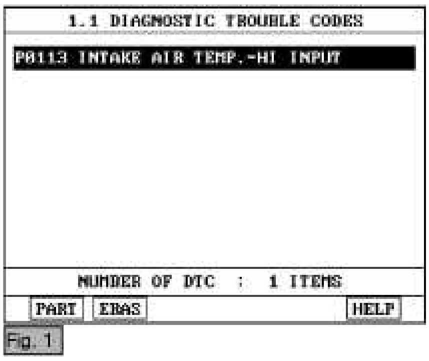
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, high	● Short to ground in signal circuit (pin 36 to 42) ● Faulty IATS ● Faulty PCM
Threshold value	● Measured temperature : > 128.25°C(262.85°F)	
Enable Conditions	● Idle	
Diagnostic Time	● 0.2 sec	
Fail Safe	● No failurre detected on ECTS - The limp home value of IATS depends on ECTS. ● Failure detected on ECTS - PCM controls with mapping data.	

MONITOR DTC STATUS

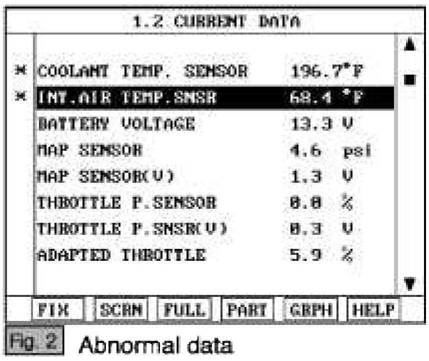
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "IATS signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0113 INTAKE AIR TEMP.-HI INPUT

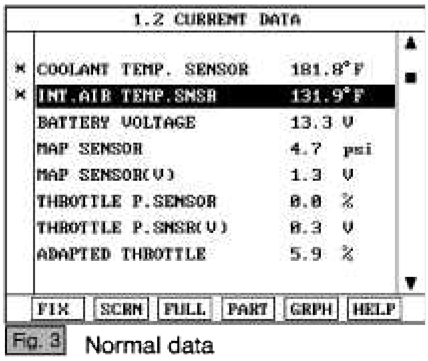
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* COOLANT TEMP. SENSOR    196.7°F
* INT.AIR TEMP.SNSR       68.4 °F
  BATTERY VOLTAGE         13.3 V
  MAP SENSOR              4.6  psi
  MAP SENSOR(V)           1.3  V
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SNSR(V)      0.3  V
  ADAPTED THROTTLE        5.9  %
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* COOLANT TEMP. SENSOR    181.8°F
* INT.AIR TEMP.SNSR       131.9°F
  BATTERY VOLTAGE         13.3 V
  MAP SENSOR              4.7  psi
  MAP SENSOR(V)           1.3  V
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SNSR(V)      0.3  V
  ADAPTED THROTTLE        5.9  %
```

Fig. 3 Normal data

NOTE

If the output voltage moves in reverse direction while air temperature changes,the IAT sensor is normal. When IAT sensor is in malfunction, the default value for IAT is 20.3°C.

Service standard
0°C (32°F) : 4.0~4.4 V
20°C(68°F) : 3.3~3.7 V
40°C(104°F) : 2.5~2.9 V
80°C(176°F) : 1.0~1.4 V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

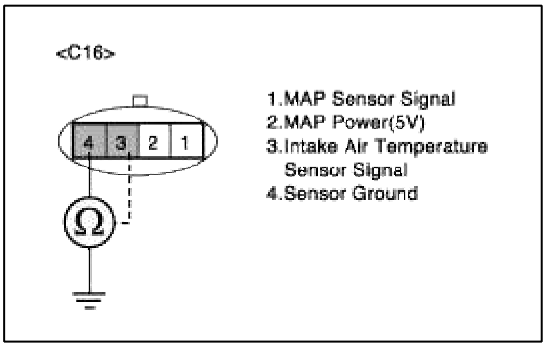
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect IAT sensor connector and ECM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 4 of sensor harness connector and chassis ground.
   (5) Measure resistance between terminal 3 and 4 of sensor harness connector



   (6) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

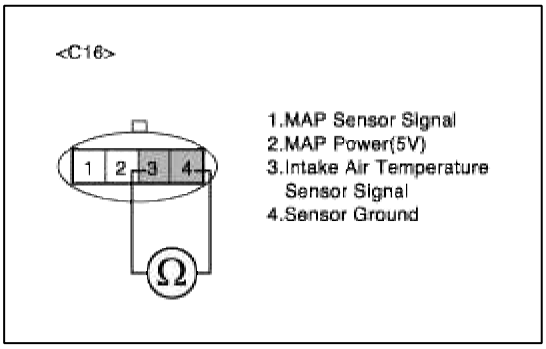
Short circuit between IATS signal circuit and ground circuit.
Short chassis ground between IATS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

COMPONENT INSPECTION

1. Check IATS

Measuring the resistence of IAT sensor is to find whether the open circuit exists in the sensor's inner side.

(1) Measure resistance between terminal 3 and 4 of sensor connector(To sensor side)


<C16>
1
2
3
4
Ω
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground

(2) Does each resistance indicate continuity circuit?

YES

Go to "Check PCM" as below.

NO

Open circuit IATS .

Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

The purpose to measure IAT resistence is to decide where open circuit exists and the method is to check continuity between IAT signal line and ground line.

2. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of PCM .

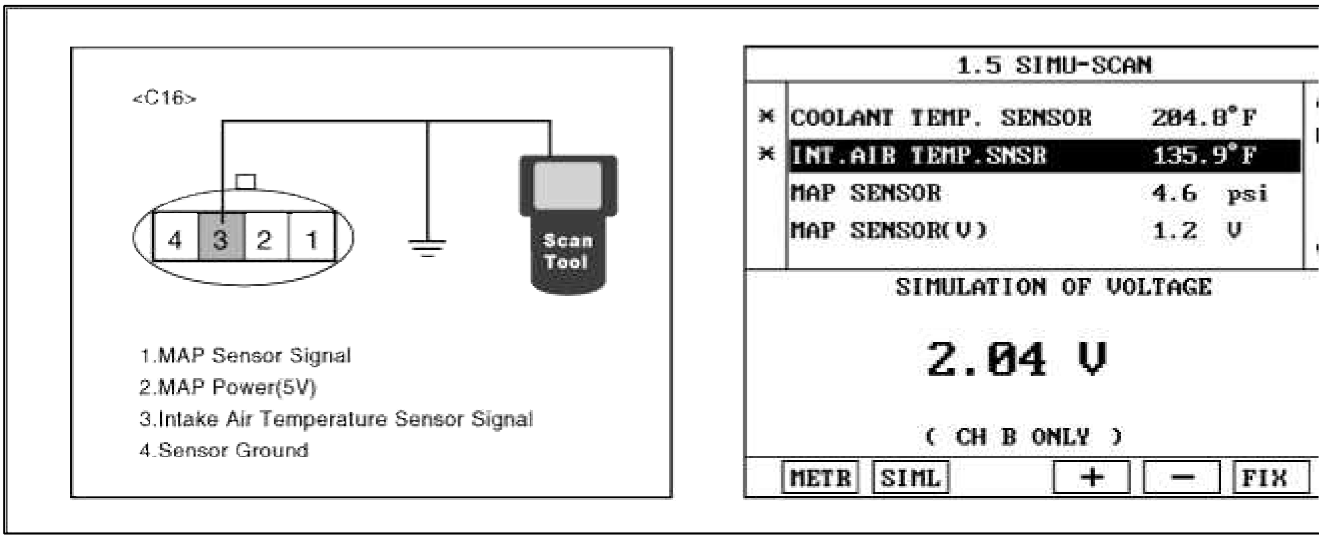
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 3 of IAT sensor signal connector.

(5) Verify IATS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V


<C16>
4
3
2
1
Scan Tool
1.MAP Sensor Signal
2.MAP Power(5V)
3.Intake Air Temperature Sensor Signal
4.Sensor Ground
METR
SIML
+
−
FIX

```
            1.5 SIMU-SCAN
× COOLANT TEMP. SENSOR      204.8°F
× INT.AIR TEMP.SNSR         135.9°F
  MAP SENSOR                4.6  psi
  MAP SENSOR(V)             1.2  V
        SIMULATION OF VOLTAGE

              2.04 V

            ( CH B ONLY )
```

(6) Is IAT sensor signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

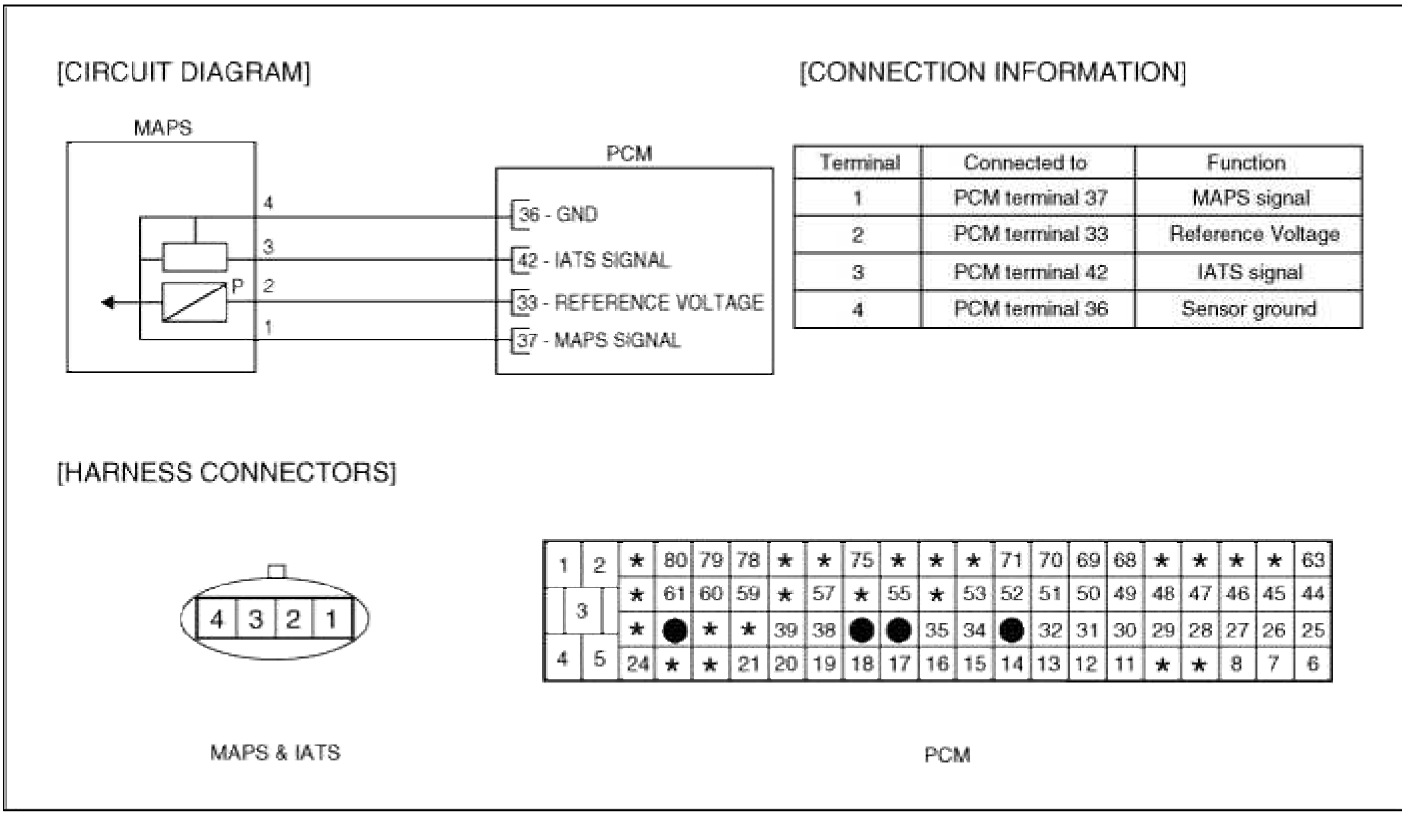
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM



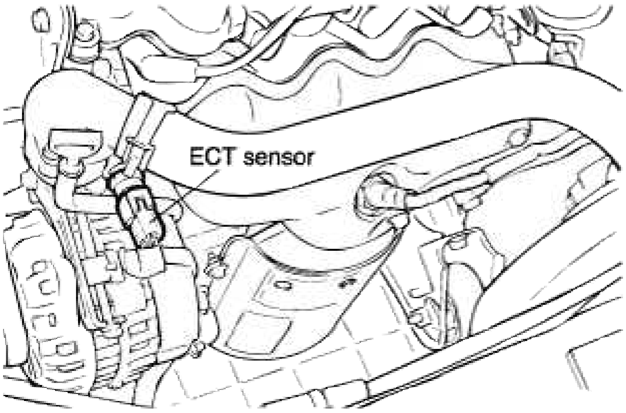
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM terminal 37	MAPS signal
2	PCM terminal 33	Reference Voltage
3	PCM terminal 42	IATS signal
4	PCM terminal 36	Sensor ground

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	●	★	★	39	38	●	●	35	34	●	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0116

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
Monitoring Strategy		● Rathionality check	● Poor connections ● Faulty PCM ● Faulty ETCS ● Contaminated, deterriorated or damaged ETCS ● Faulty thermostat ● Foreign materials fouled ETCS
Case1	Threshold value	● Measured temp.-Model temp. : < -15°C(5 °F)	
	Enable Conditions	● No block heater detected ● Model temp. = f(air mass, current model temp.)	
	Diagnostic Time	● 0.5 sec	
Case2	Threshold value	● Max temp-Min temp : < 1.5-3 degC(34.7 °F-37.4 °F)	
	Enable Conditions	● Low heat power mode driving counter > 2 ● High heat power mode driving counter> 2	
	Diagnostic Time		
Fail Safe		● The limp home value of ECTS depends on intake air temperature.	

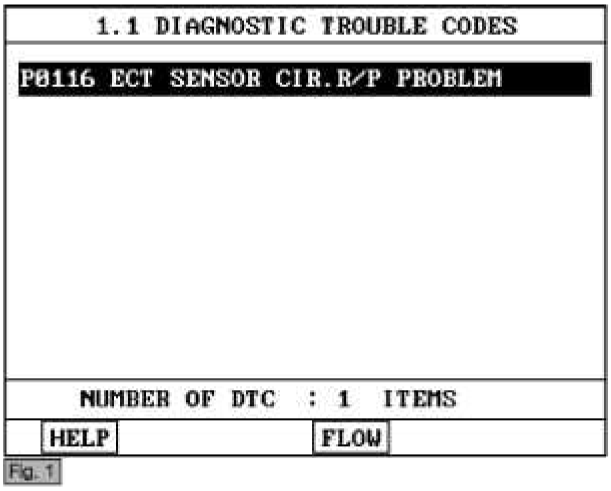
NOTE

If any codes relating to ECTS, IATS circuits are present,do all repairs associated with those codes before proceeding with this troubleshooting procedure.

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "ECTS signal" parameter on the scantool.

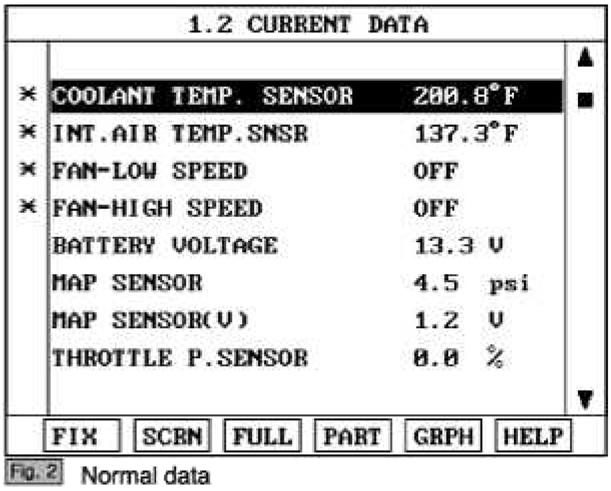


1.1 DIAGNOSTIC TROUBLE CODES

P0116 ECT SENSOR CIR.R/P PROBLEM

NUMBER OF DTC : 1 ITEMS

Fig. 1



1.2 CURRENT DATA

*	COOLANT TEMP. SENSOR	200.8°F
*	INT.AIR TEMP.SNSR	137.3°F
*	FAN-LOW SPEED	OFF
*	FAN-HIGH SPEED	OFF
	BATTERY VOLTAGE	13.3 V
	MAP SENSOR	4.5 psi
	MAP SENSOR(V)	1.2 V
	THROTTLE P.SENSOR	0.0 %

Fig. 2 Normal data

NOTE

If the output data changes as temoerature changes,the sensor is good.
If the ECTS output is in inverse proportion to water temperature,the sensor is normal.

Service standard
When ECT is 0°C (32°F) : 4.27 ± 0.3 V
When ECT is 20°C(68°F) : 3.44 ± 0.3 V
When ECT is 40°C(104°F) : 2.72 ± 0.3 V
When ECT is 80°C(176°F) : 1.25 ± 0.3 V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

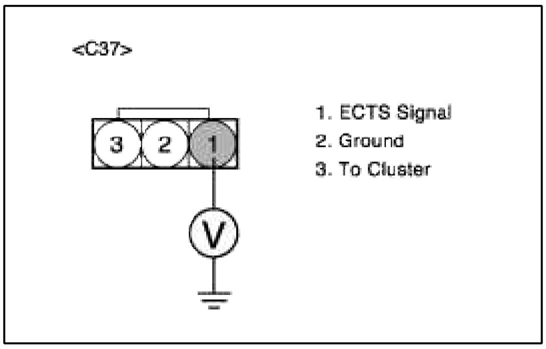
NO

Go to ""Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ECT sensor connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Ground Circuit Inspection " procedure.

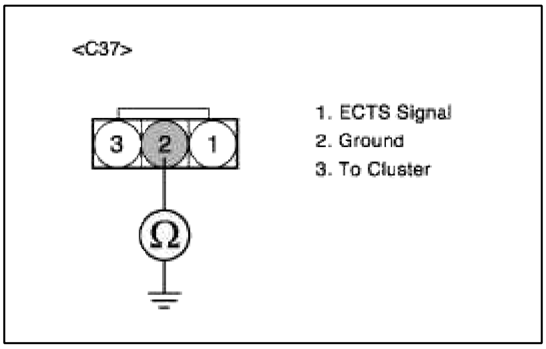
NO

In case over 5V : Short circuit to battery between ECTS harness connector and ECM harness connector.
In case 0V: Open circuit between ECTS harness connector and ECM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

> **NOTE**
>
> 1.In case,when ECTS connector is disconnected,the voltage at terminal 1 is 0V.
> Possible cause : Open or short between Terminal 1 of ETCS connector and terminal 39 of ECM.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ECT sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

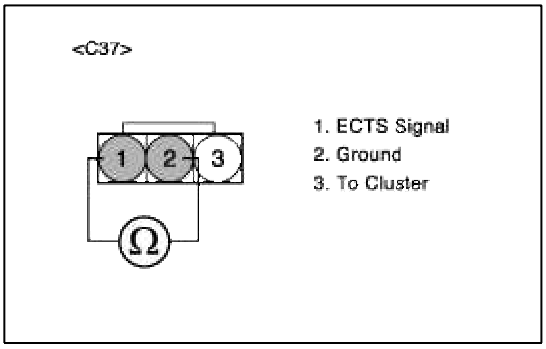
Open circuit between ECTS harness connector and PCM harness connector.
Open circuit between PCM harness connector and chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

> **NOTE**
>
> In case,when measuring resistence of ground circuit,the resistence is over 1ohm.
> Possible cause : Short circuit between PCM ground point and PCM terminal 35

COMPONENT INSPECTION

1. Check ECTS

(1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



(2) Does each resistance indicate continuity circuit?

YES

Go to "Check PCM" as below.

NO

Open circuit ECTS .

Repair as necessary and then go to "Verification of Vehicle Repair" procedure

2. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of PCM .

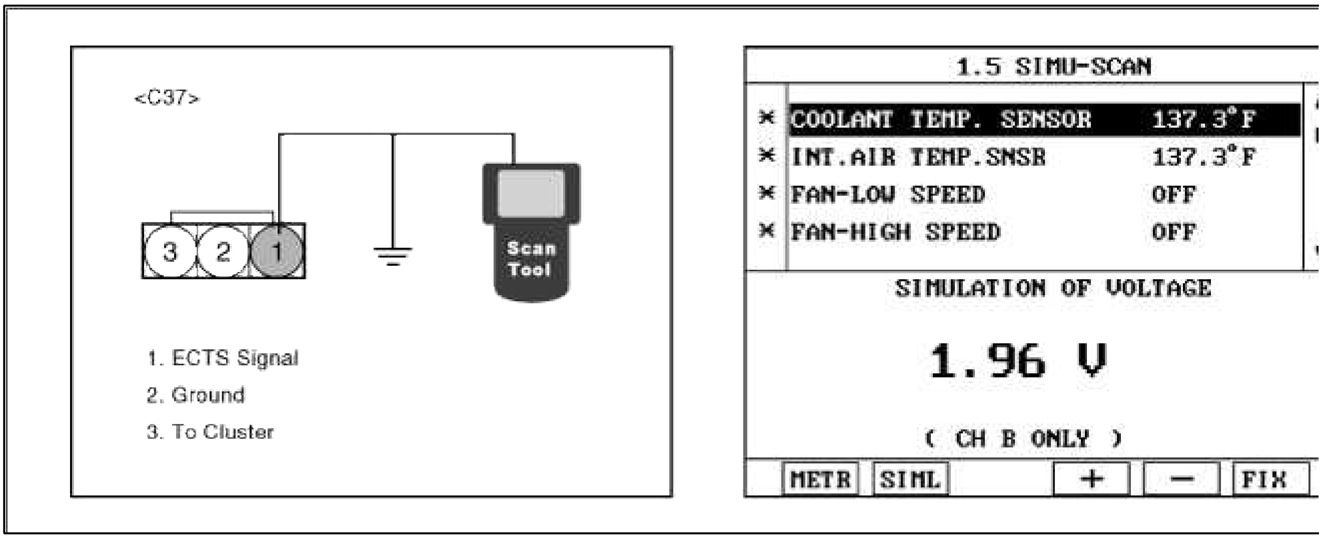
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of ECT sensor signal connector.

(5) Verify ECTS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



1.5 SIMU-SCAN

*	COOLANT TEMP. SENSOR	137.3°F
*	INT.AIR TEMP.SNSR	137.3°F
*	FAN-LOW SPEED	OFF
*	FAN-HIGH SPEED	OFF

SIMULATION OF VOLTAGE

1.96 V

(CH B ONLY)

(6) Is ECT sensor signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

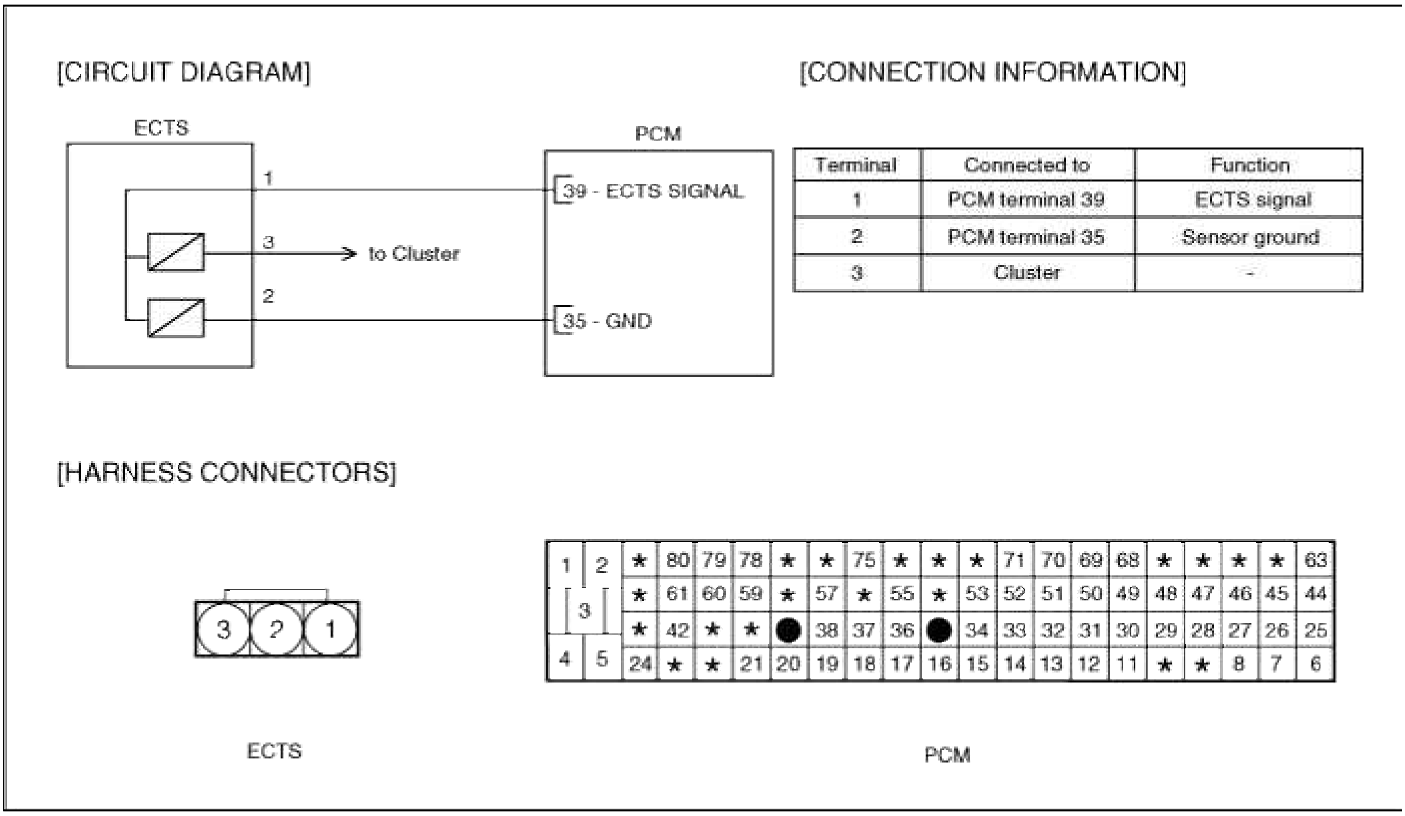
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
ECTS
1
3
2
to Cluster
PCM
39 - ECTS SIGNAL
35 - GND
[HARNESS CONNECTORS]
3
2
1
ECTS
PCM

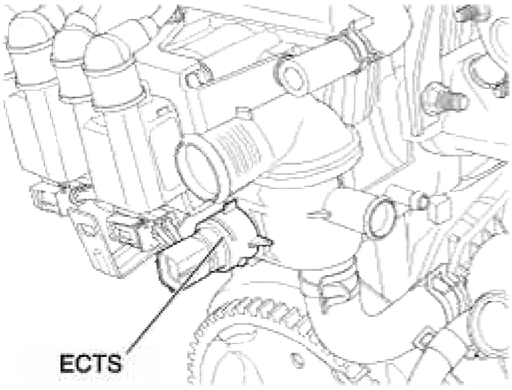
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM terminal 39	ECTS signal
2	PCM terminal 35	Sensor ground
3	Cluster	-

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	●	38	37	36	●	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0117

COMPONENT LOCATION



GENERAL DESCTIPTION

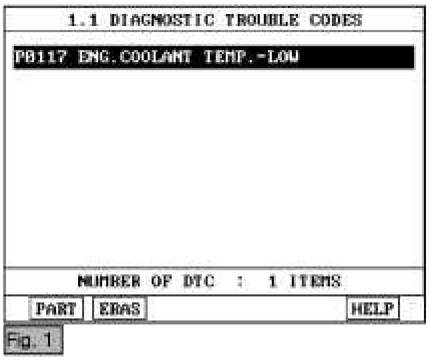
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, Low	● Open in signal circuit ● Short to battery in signal circuit ● Open in ground circuit ● Faulty ECTS ● Faulty PCM
Threshold value	● Measured temperature : < -38.25°C(-36.85°F)	
Enable Conditions	● Open circuit	
Diagnostic Time	● 0.5 sec	
Fail Safe	● The limp home value of ECTS depends on intake air temperature.	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ECTS signal" parameter on the scantool.

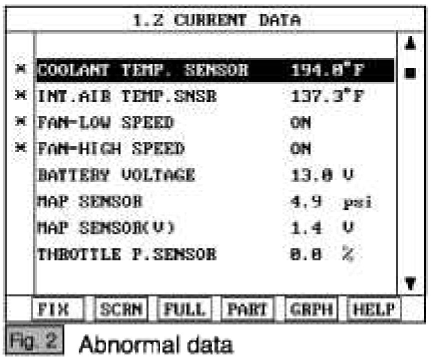


```
1.1 DIAGNOSTIC TROUBLE CODES

P0117 ENG.COOLANT TEMP.-LOW

NUMBER OF DTC  :  1 ITEMS
```

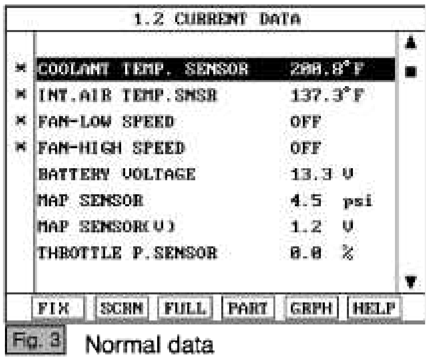
Fig. 1



```
1.2 CURRENT DATA

* COOLANT TEMP. SENSOR     194.0°F
* INT.AIR TEMP.SNSR        137.3°F
* FAN-LOW SPEED            ON
* FAN-HIGH SPEED           ON
  BATTERY VOLTAGE          13.0 V
  MAP SENSOR               4.9  psi
  MAP SENSOR(V)            1.4  V
  THROTTLE P.SENSOR        0.0  %
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA

* COOLANT TEMP. SENSOR     200.8°F
* INT.AIR TEMP.SNSR        137.3°F
* FAN-LOW SPEED            OFF
* FAN-HIGH SPEED           OFF
  BATTERY VOLTAGE          13.3 V
  MAP SENSOR               4.5  psi
  MAP SENSOR(V)            1.2  V
  THROTTLE P.SENSOR        0.0  %
```

Fig. 3 Normal data

> **NOTE**
>
> If the output data changes as temoerature changes,the sensor is good.
> If the ECTS output is in inverse proportion to water temperature,the sensor is normal.

Service standard
When ECT is 0°C (32°F) : 4.27 ± 0.3 V
When ECT is 20°C(68°F) : 3.44 ± 0.3
When ECT is 40°C(104°F) : 2.72 ± 0.3 V
When ECT is 80°C(176°F) : 1.25 ± 0.3 V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

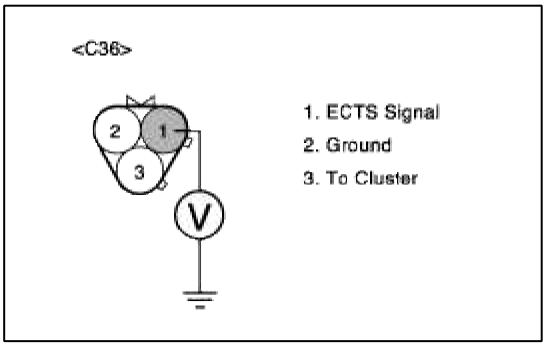
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect ETC sensor connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 1 of sensor harness connector and chassis ground.



(5) Is measure voltage within Specification?

YES

Go to "Check for short to power in harness " as below.

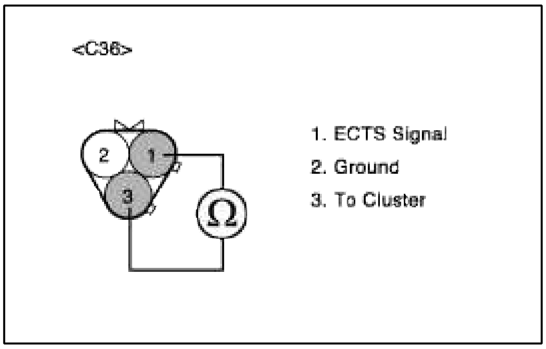
NO

In case over 5V : Short circuit to battery between ECTS harness connector and PCM harness connector.
In case 0V: Open circuit between ECTS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

In case,when ECTS connector is disconnected,the voltage at terminal 1 is 0V.
Possible cause : Open or short between Terminal 1 of ETCS connector and terminal 39 of PCM.

2. Check for short to power in harness
    (1) Ignition "OFF"
    (2) Disconnect ECT sensor connector and PCM connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure resistance between terminal 1 and 3 of sensor harness connector.



    (5) Is measure resistance within Specification?

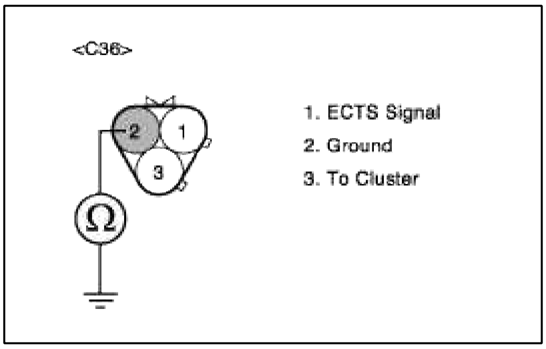
YES

Go to "Ground Circuit Inspection" procedure.

NO

Short circuit between cluster signal circuit and ECTS signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

1. Ignition "OFF"
2. Disconnect ECT sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

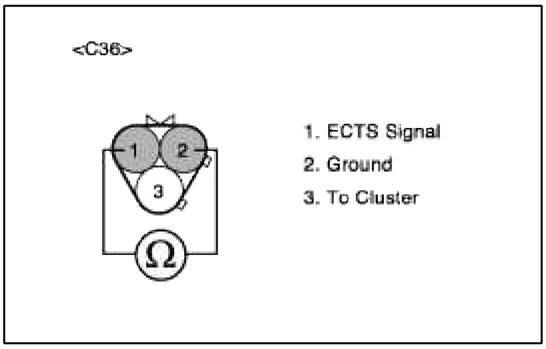
Open circuit between ECTS harness connector and PCM harness connector.
Open circuit between PCM harness connector and chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

NOTE

In case,when measuring resistence of ground circuit,the resistence is over 1ohm.
Possible cause : Short circuit between PCM ground point and PCM terminal 35

COMPONENT INSPECTION

1. Check ECTS
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Does each resistance indicate continuity circuit?

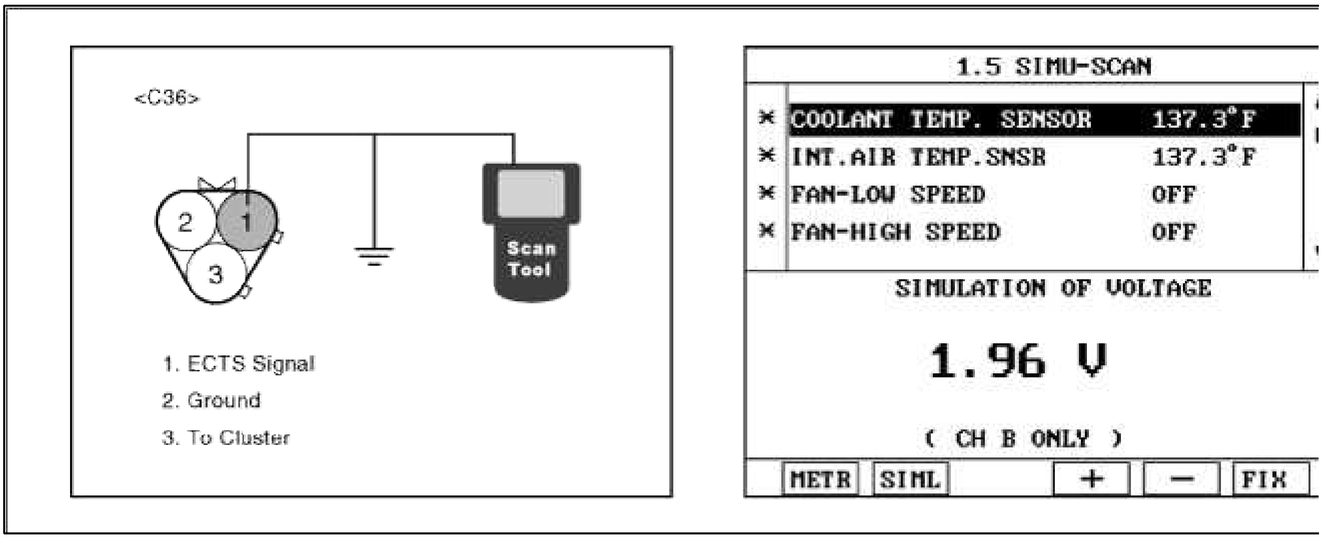
YES

Go to "Check PCM" as below.

NO

Open circuit ECTS .
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

2. Check PCM
   The purpose of checking ECM is to determine whether there is any malfunction of ECM .
   (1) Ignition "OFF"
   (2) Connect Scantool and Engine "ON "
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 1 of ECT sensor signal connector.
   (5) Verify ECTS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



```
1.5 SIMU-SCAN
* COOLANT TEMP. SENSOR    137.3°F
* INT.AIR TEMP.SNSR       137.3°F
* FAN-LOW SPEED           OFF
* FAN-HIGH SPEED          OFF
     SIMULATION OF VOLTAGE

            1.96 V

         ( CH B ONLY )
```

   (6) Is ECT sensor signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.

2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

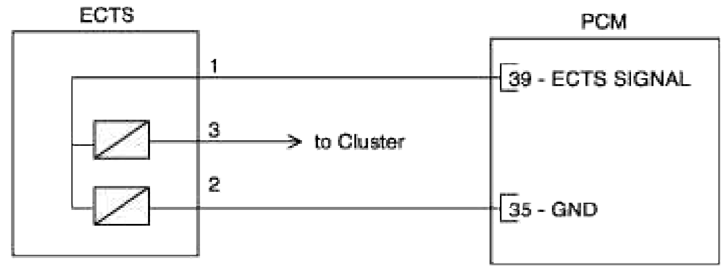
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

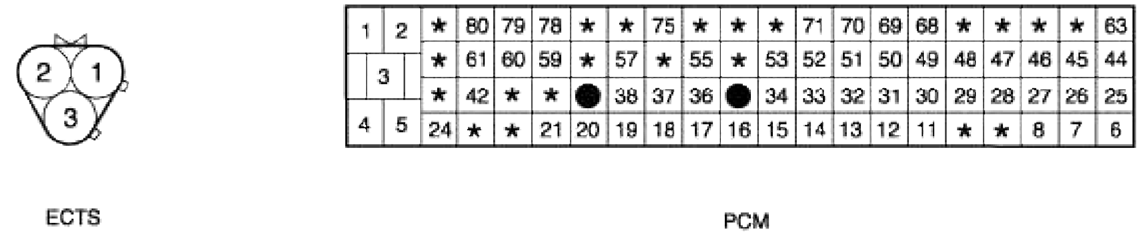
[CIRCUIT DIAGRAM]


ECTS
PCM
1
3
2
39 - ECTS SIGNAL
to Cluster
35 - GND

[CONNECTION INFORMATION]

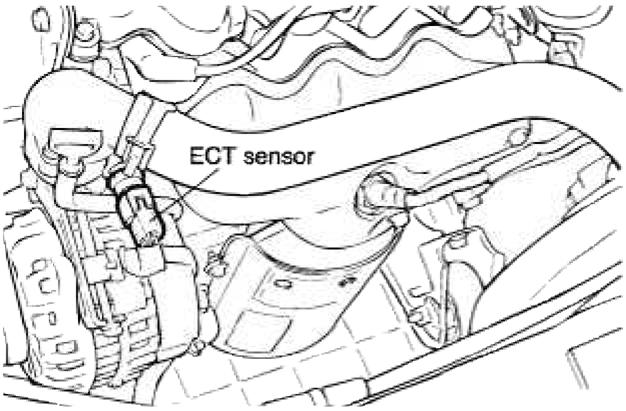
Terminal	Connected to	Function
1	PCM terminal 39	ECTS signal
2	PCM terminal 35	Sensor ground
3	Cluster	-

[HARNESS CONNECTORS]


2 1 3
ECTS
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ ● 38 37 36 ● 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P0118

COMPONENT LOCATION



GENERAL DESCTIPTION

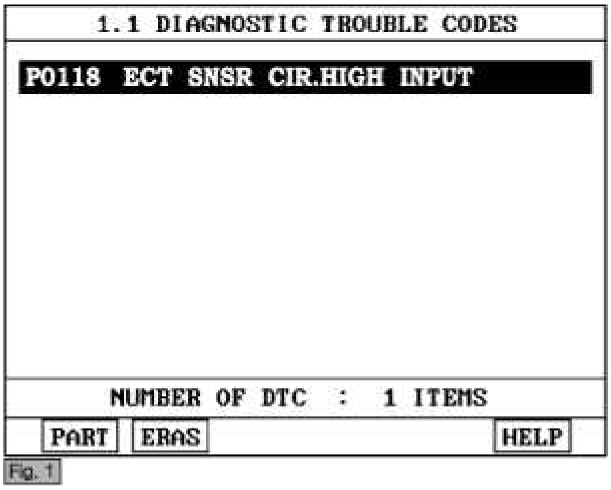
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, High	● Short to ground in signal circuit (pin 39 to 35) ● Faulty ECTS ● Faulty PCM
Threshold value	● Measured temperature : > 138.75°C (281.75 °F)	
Enable Conditions	● Short circuit	
Diagnostic Time	● 0.5 sec	
Fail Safe	● The limp home value of ECTS depends on intake air temperature.	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ECTS signal" parameter on the scantool.

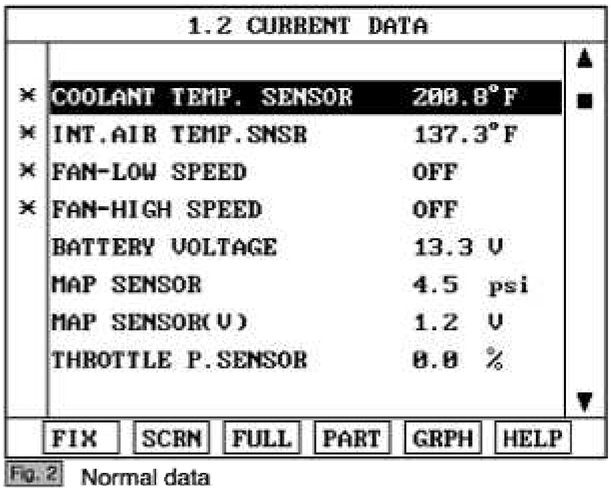


```
1.1 DIAGNOSTIC TROUBLE CODES

P0118  ECT SNSR CIR.HIGH INPUT

NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

× COOLANT TEMP. SENSOR     200.0°F
× INT.AIR TEMP.SNSR        137.3°F
× FAN-LOW SPEED            OFF
× FAN-HIGH SPEED           OFF
  BATTERY VOLTAGE          13.3 V
  MAP SENSOR               4.5  psi
  MAP SENSOR(V)            1.2  V
  THROTTLE P.SENSOR        0.0  %
```

Fig. 2 Normal data

> **NOTE**
>
> If the output data changes as temoerature changes,the sensor is good.
> If the ECTS output is in inverse proportion to water temperature,the sensor is normal.

Service standard
When ECT is 0°C (32°F) : 4.27 ± 0.3 V
When ECT is 20°C(68°F) : 3.44 ± 0.3 V
When ECT is 40°C(104°F) : 2.72 ± 0.3 V
When ECT is 80°C(176°F) : 1.25 ± 0.3 V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for short to ground in harness

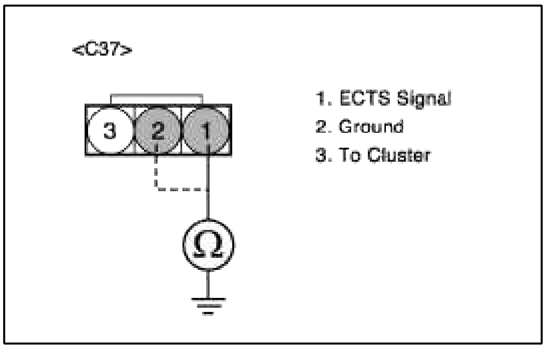
(1) Ignition "OFF"

(2) Disconnect ECT sensor connector and PCM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure resistance between terminal 1 of sensor harness connector and chassis ground.

(5) Measure resistance between terminal 1 and 2 of sensor harness connector.



(6) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

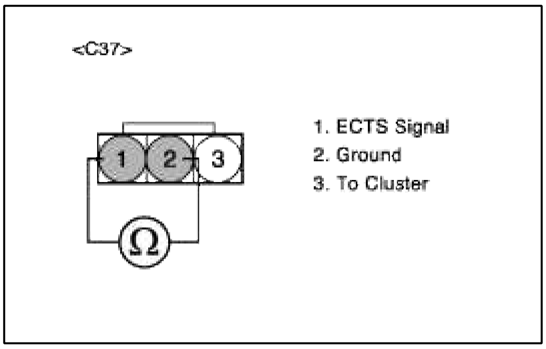
Short circuit between ECTS signal circuit and ground circuit.

Short chassis ground between ECTS harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure

COMPONENT INSPECTION

1. Check ECTS
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Does each resistance indicate continuity circuit?

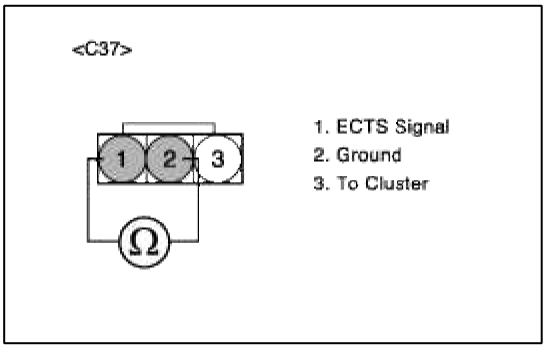
YES

Go to "Check PCM" as below.

NO

Open circuit ECTS .
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

2. Check PCM
   The purpose of checking ECM is to determine whether there is any malfunction of PCM .
   (1) Ignition "OFF"
   (2) Connect Scantool and Engine "ON "
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 1 of ECT sensor signal connector.
   (5) Verify ECTS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



   (6) Is ECT sensor signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

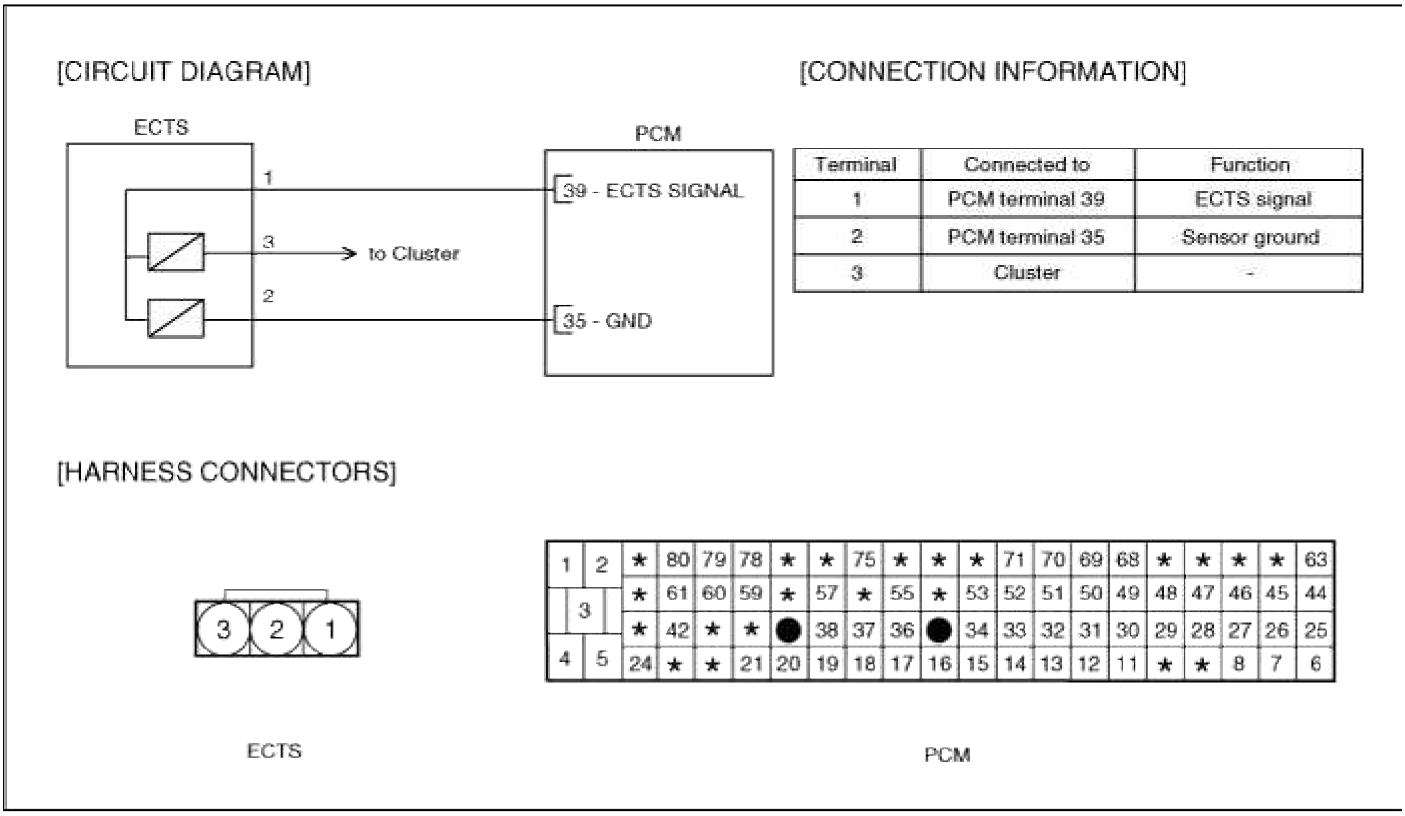
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

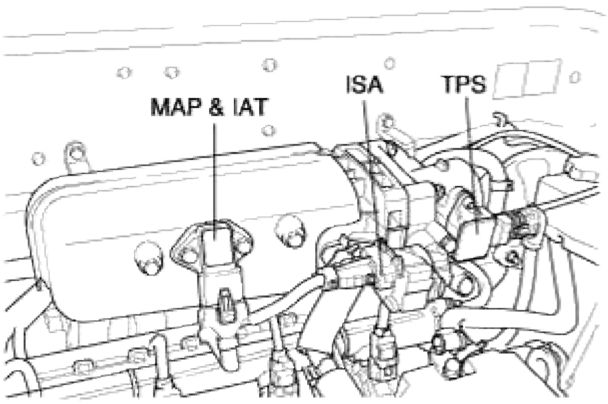

[CIRCUIT DIAGRAM]
ECTS
PCM
1
3
2
to Cluster
39 - ECTS SIGNAL
35 - GND
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
3 2 1
ECTS
PCM

Terminal	Connected to	Function
1	PCM terminal 39	ECTS signal
2	PCM terminal 35	Sensor ground
3	Cluster	-

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	●	38	37	36	●	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0121

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

DTC DESCRIPTION

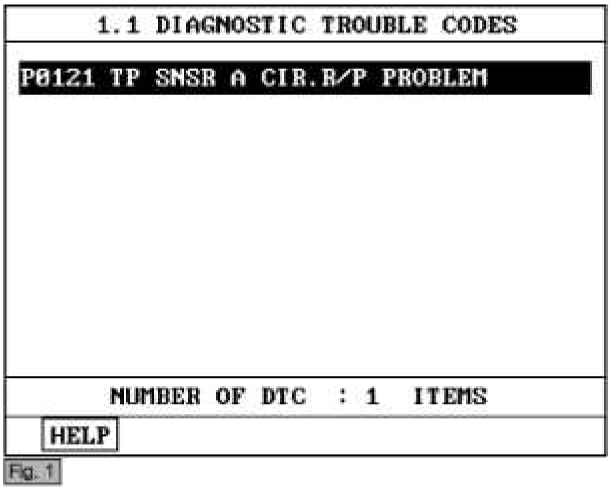
DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
DTC Strategy		● Rationality check	● Poor connections ● Faulty TPS ● Faulty PCM ● Open or short in battery circuit ● Dirty air cleaner ● Air leak in intake system ● Contaminated, deterriorated or damaged TPS
case1	Threshold value	● Difference between load signal by Map sensor and load signal calculated by TPS : <0.75 ● Difference between load signal by Map sensor and load signal calculated by TPS : > 1.25	
	Enable Conditions	● Engine speed > target idle speed ● 20sec after engine start	
case2	Threshold value	● Modeled relative load - relative load > KLDRLTPS ● Modeled relative load - relative load > KLDRLTPSv	
	Enable Conditions	● Off idle ● Deviation of fast lambda control factor from 1.0 < 0.1 ● Engine coolant temperature > 85 degC(185 °F) ● Engine speed > 600 rpm ● Gradient of TPS signal < 0.15 % ● Vehicle speed = 0 kph ● Vehicle speed > 0 kph	
Diagnostic Time		● 5 sec	
Fail Safe		● Throttle position value is determined by function of engine speed, MAP sensor and idle duty.	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "TPS signal" parameter on the scantool.

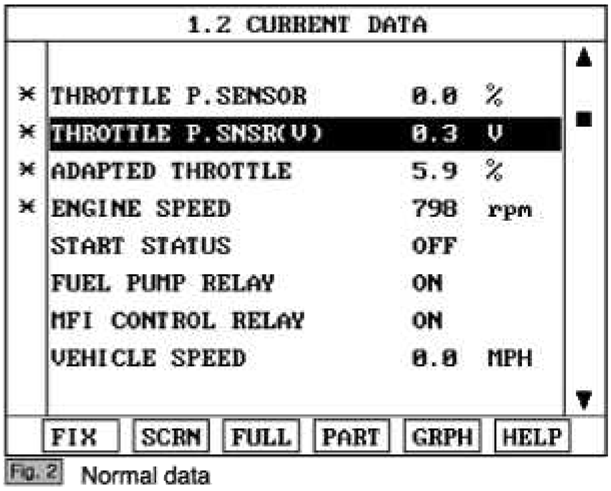


```
1.1 DIAGNOSTIC TROUBLE CODES

P0121 TP SNSR A CIR.R/P PROBLEM

NUMBER OF DTC  : 1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* THROTTLE P.SENSOR        0.0  %
* THROTTLE P.SNSR(V)       0.3  V
* ADAPTED THROTTLE         5.9  %
* ENGINE SPEED             798  rpm
  START STATUS             OFF
  FUEL PUMP RELAY          ON
  MFI CONTROL RELAY        ON
  VEHICLE SPEED            0.0  MPH
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.
It is normal that the output of TPS changes in accordance with that of MAP sensor.

Service standard
Idle : 0%(250~850mV)
Gradually open : Inccreases
Open fully : 75~85%(4000~4800mV)

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

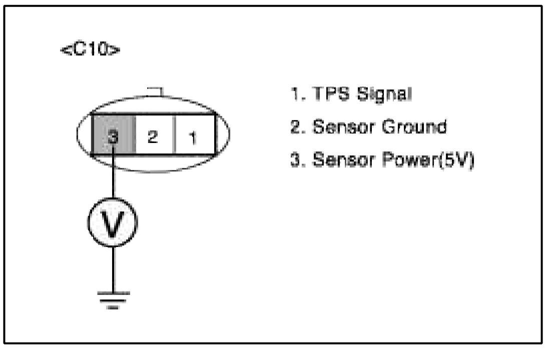
NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect TPS sensor connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 3 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

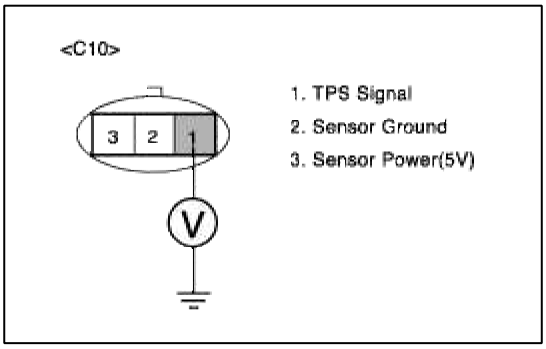
NO

Open circuit or short circuit to chassis ground between TPS harness connector and reference voltage.
Open circuit or short circuit to chassis ground between TPS harness connector and PCM connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the TPS connector is disconnected,the voltage of TPS terminal 2 is 0 V.
> Possible cause: Open or short between terminal 32 of PCM and Terminal 2 of TPS

SIGNAL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect TPS sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Ground Circuit Inspection" procedure.

NO

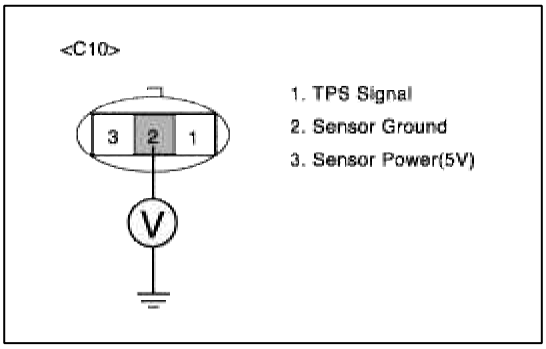
Open circuit or short circuit to chassis ground between TPS harness connector and signal circuit.
Open circuit between TPS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the TPS connector is disconnected,the voltage of TPS terminal 1 is 0 V.
> Possible cause: Open or short between terminal 16 of PCM and Terminal 1 of TPS

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"

2. Disconnect TPS sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

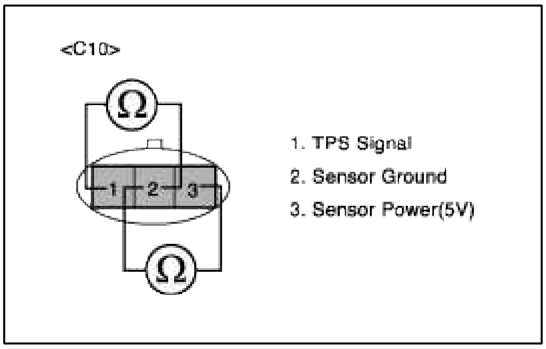
NO

Open circuit between TPS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the TPS connector is disconnected,the voltage of TPS terminal 3 is infinite.
> Possible cause: Open circuit between terminal 17 of PCM and Terminal 3 of TPS

COMPONENT INSPECTION

1. Check TPS
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)
   (2) Measure resistance between terminal 2 and 3 of sensor connector(To sensor side)



   (3) Does each resistance indicate continuity circuit?

YES

Go to "Check PCM" as below.

NO

Open circuit TPS.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of ECM .

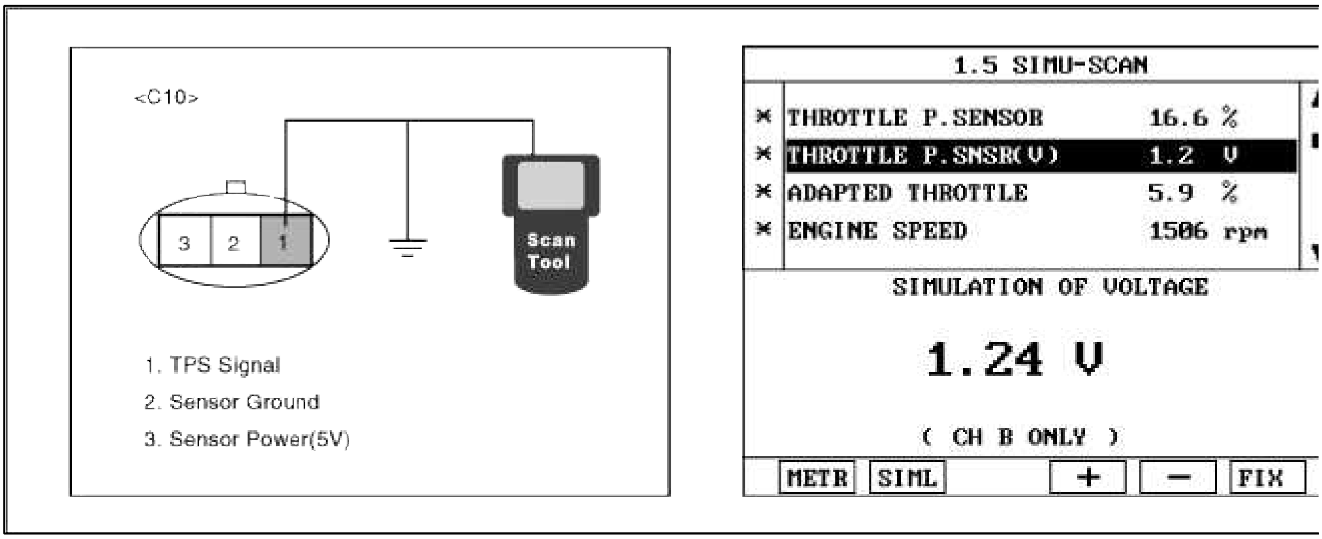
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of TPS sensor signal connector.

(5) Verify TPS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



```
1.5 SIMU-SCAN
* THROTTLE P.SENSOR      16.6 %
* THROTTLE P.SNSR(V)     1.2  V
* ADAPTED THROTTLE       5.9  %
* ENGINE SPEED           1506 rpm
SIMULATION OF VOLTAGE
1.24 V
( CH B ONLY )
```

(6) Is TPS signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

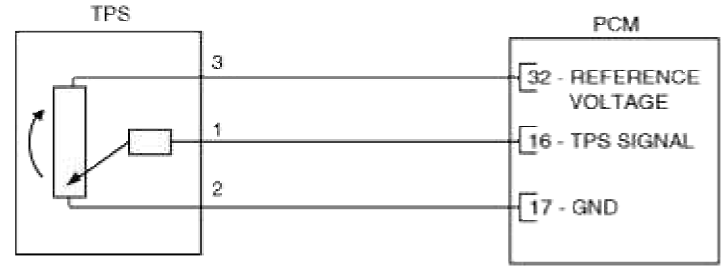
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

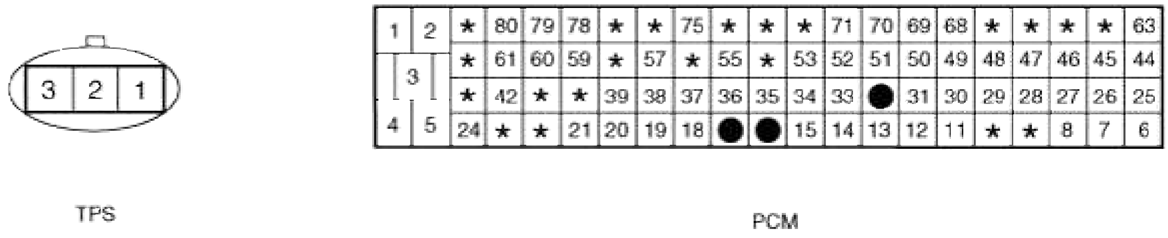
[CIRCUIT DIAGRAM]


TPS
PCM
3
1
2
32 - REFERENCE VOLTAGE
16 - TPS SIGNAL
17 - GND

[CONNECTION INFORMATION]

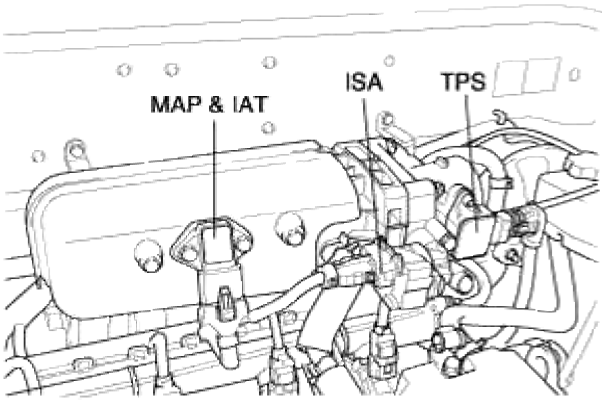
Terminal	Connected to	Function
3	PCM terminal 32	Reference Voltage
2	PCM terminal 17	Sensor ground
1	PCM terminal 16	TPS signal

[HARNESS CONNECTORS]


3 2 1
TPS
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 ● 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 ● ● 15 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P0122

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

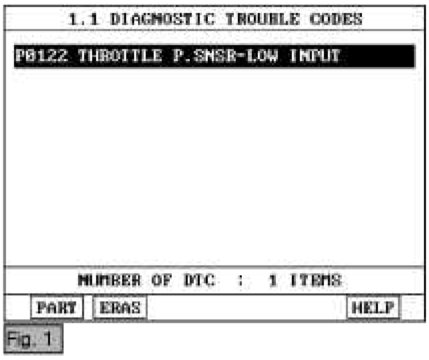
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, low	● Short to ground in signal circuit (pin 16 to 17) ● Open in power circuit (pin 32) ● Faulty TPS ● Faulty PCM
Threshold value	● Calculated signal from sensor : < 3.14%	
Enable Conditions	● Engine speed > 600rpm	
Diagnostic Time	● 0.02 sec	
Fail Safe	● Throttle position value is determined by function of engine speed, MAP sensor and idle duty.	

MONITOR DTC STATUS

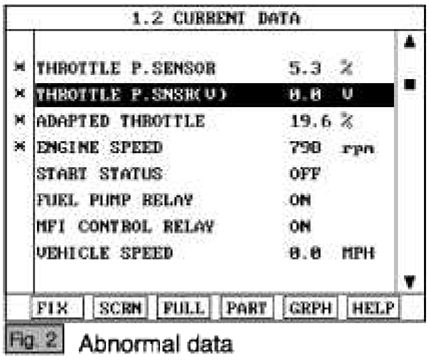
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "TPS signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0122 THROTTLE P.SNSR-LOW INPUT

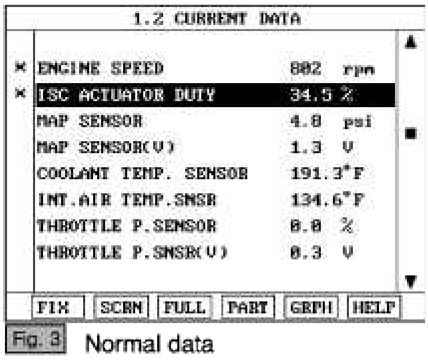
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* THROTTLE P.SENSOR      5.3  %
* THROTTLE P.SNSR(V)     0.0  V
* ADAPTED THROTTLE       19.6 %
* ENGINE SPEED           790  rpm
  START STATUS           OFF
  FUEL PUMP RELAY        ON
  MFI CONTROL RELAY      ON
  VEHICLE SPEED          0.0  MPH
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED           802  rpm
* ISC ACTUATOR DUTY      34.5 %
  MAP SENSOR             4.0  psi
  MAP SENSOR(V)          1.3  V
  COOLANT TEMP. SENSOR   191.3°F
  INT.AIR TEMP.SNSR      134.6°F
  THROTTLE P.SENSOR      0.0  %
  THROTTLE P.SNSR(V)     0.3  V
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.
It is normal that the output of TPS changes in accordance with that of MAP sensor.

Service standard
Idle : 0%(250~850mV)
Gradually open : Inccreases
Open fully : 75~85%(4000~4800mV)

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

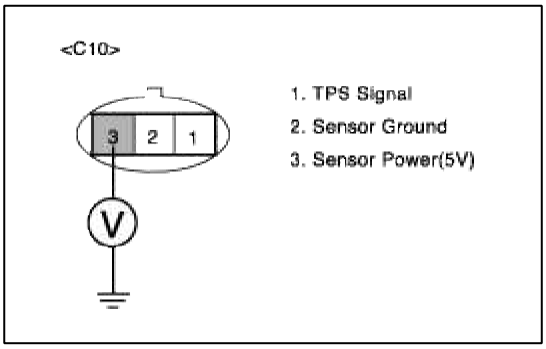
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect TPS sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

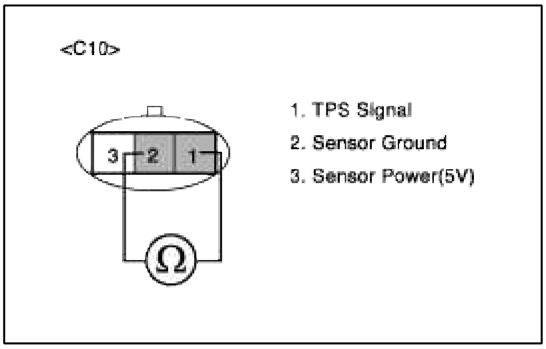
Open circuit or short circuit to chassis ground between TPS harness connector and reference voltage.
Open circuit or short circuit to chassis ground between TPS harness connector and PCM connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when the TPS connector is disconnected,the voltage of TPS terminal 2 is 0 V.
Possible cause: Open or short between terminal 32 of PCM and Terminal 2 of TPS

SIGNAL CIRCUIT INSPECTION

1. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect TPS sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 and 2 of sensor harness connector.



(5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit to ground between TPS harness connector and signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when the TPS connector is disconnected,the voltage of TPS terminal 1 is 0 V.

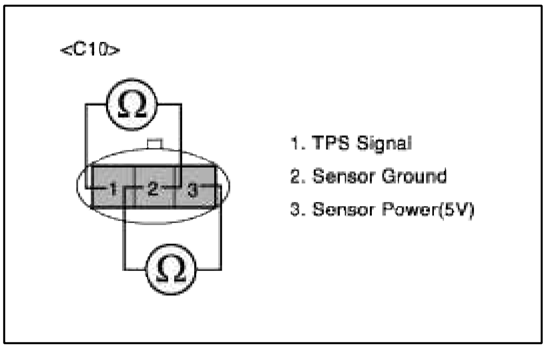
Possible cause: Open or short between terminal 16 of PCM and terminal 1 of TPS.

COMPONENT INSPECTION

1. Check TPS

(1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)

(2) Measure resistance between terminal 2 and 3 of sensor connector(To sensor side)



(3) Does each resistance indicate continuity circuit?

YES

Go to "Check PCM" as below.

NO

Open circuit TPS.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check PCM

The purpose of checking PCM is to determine whether there is any malfunction of PCM.

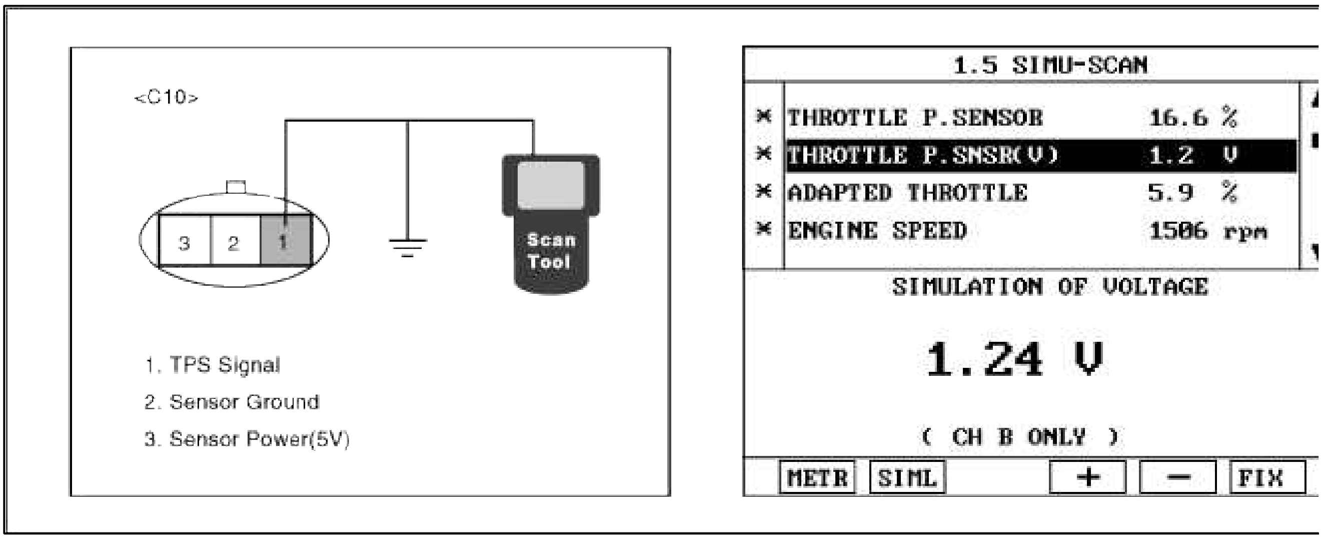
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of TPS sensor signal connector.

(5) Verify TPS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



```
1.5 SIMU-SCAN
* THROTTLE P.SENSOR       16.6 %
* THROTTLE P.SNSR(V)      1.2  V
* ADAPTED THROTTLE        5.9  %
* ENGINE SPEED            1506 rpm
     SIMULATION OF VOLTAGE
           1.24 V
         ( CH B ONLY )
```

(6) Is TPS signal value changed according to simulation voltage ?

YES

Check TPS for contamination, deterioration, or damage. Clean TPS with suitable cleaner as necessary and dry before reinstalling. If problem still exists, Substitute with a known-good TPS and check for proper operati If the problem is corrected, replace TPS and then go to "Verification of vehicle Repair" procedure

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

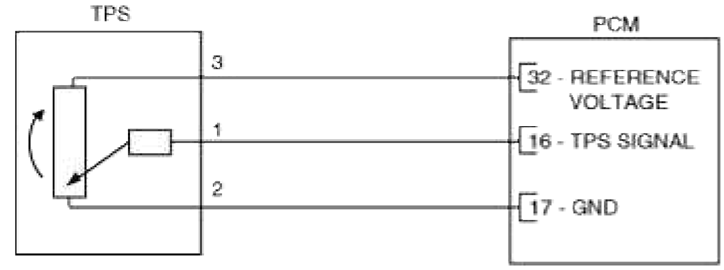
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

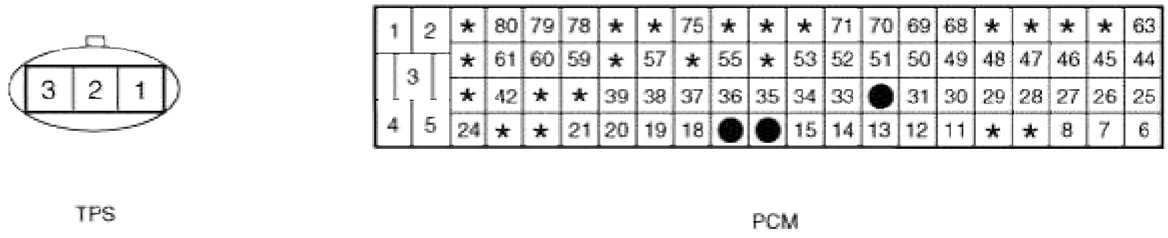
[CIRCUIT DIAGRAM]


TPS
PCM
3
1
2
32 - REFERENCE VOLTAGE
16 - TPS SIGNAL
17 - GND

[CONNECTION INFORMATION]

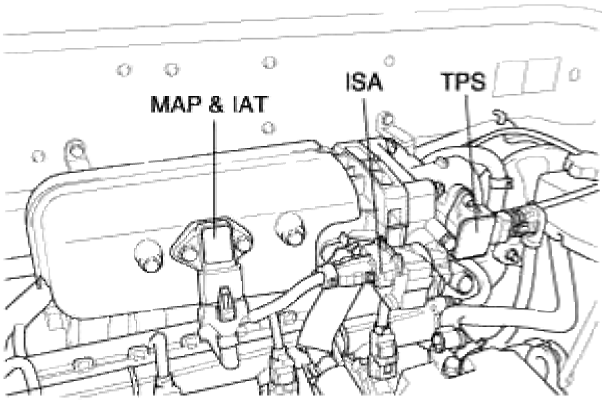
Terminal	Connected to	Function
3	PCM terminal 32	Reference Voltage
2	PCM terminal 17	Sensor ground
1	PCM terminal 16	TPS signal

[HARNESS CONNECTORS]


3 2 1
TPS
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 ● 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 ● ● 15 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P0123

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

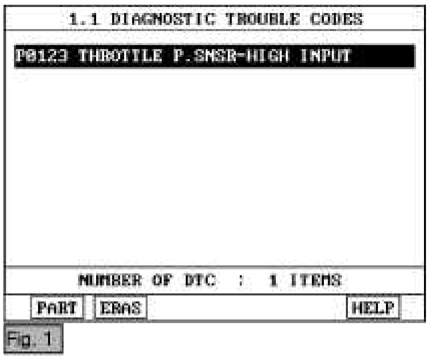
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check high	● Open in signal circuit ● Short to battery in signal circuit (pin 16 to 32) ● Open in ground circuit ● Poor connection of TPS ● Faulty TPS ● Faulty PCM
Threshold value	● Calculated signal from sensor : > 95.7%	
Enable Conditions	● Engine speed > 600rpm	
Diagnostic Time	● 0.02 sec	
Fail Safe	● Throttle position value is determined by function of engine speed, MAP sensor and idle duty.	

MONITOR DTC STATUS

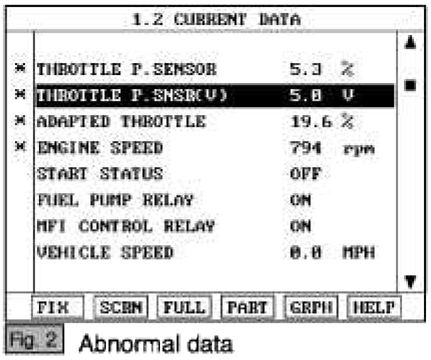
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "TPS signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0123 THROTTLE P.SNSR-HIGH INPUT

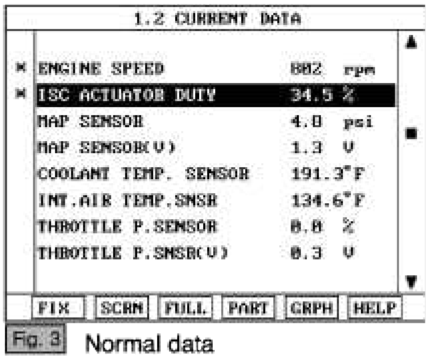
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* THROTTLE P.SENSOR       5.3  %
* THROTTLE P.SNSR(V)      5.0  V
* ADAPTED THROTTLE        19.6 %
* ENGINE SPEED            794  rpm
  START STATUS            OFF
  FUEL PUMP RELAY         ON
  MFI CONTROL RELAY       ON
  VEHICLE SPEED           0.0  MPH
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED            802  rpm
* ISC ACTUATOR DUTY       34.5 %
  MAP SENSOR              4.0  psi
  MAP SENSOR(V)           1.3  V
  COOLANT TEMP. SENSOR    191.3°F
  INT.AIR TEMP.SNSR       134.6°F
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SNSR(V)      0.3  V
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.
It is normal that the output of TPS changes in accordance with that of MAP sensor.

Service standard
Idle : 0%(250~850mV)
Gradually open : Inccreases
Open fully : 75~85%(4000~4800mV)

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.
Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

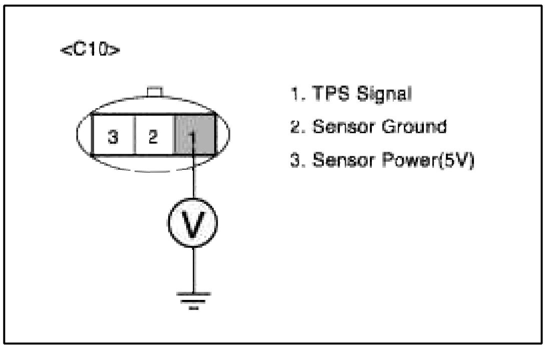
1. Check for open in harness

   (1) Ignition "OFF"

   (2) Disconnect TPS sensor connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 1 of sensor harness connector and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Check for short to power in harness " as below.

NO

Open circuit or short circuit to chassis ground between TPS harness connector and signal circuit.
Open circuit between TPS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when the TPS connector is disconnected,the voltage of TPS terminal 1 is 0 V.
Possible cause: Open or short between terminal 16 of PCM and Terminal 1 of TPS

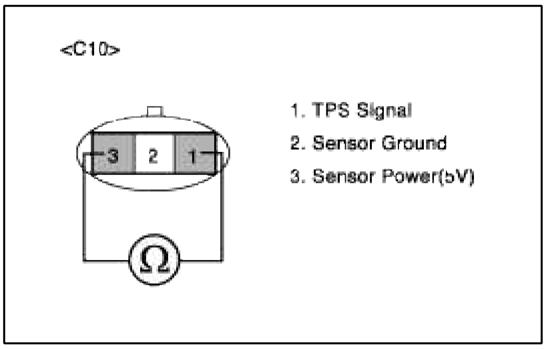
2. Check for short to power in harness

   (1) Ignition "OFF"

   (2) Disconnect TPS sensor connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure resistance between terminal 1 and 3 of sensor harness connector.



(5) Is measure resistance within Specification?

YES

Go to "Ground Circuit Inspection" procedure.

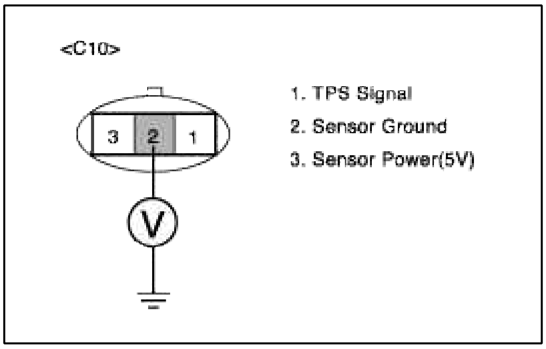
NO

Short circuit between reference voltage(5V) circuit and signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> When terminal 1 and 2 of TPS is shorted,the resistance goes below 1Ω.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect TPS sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

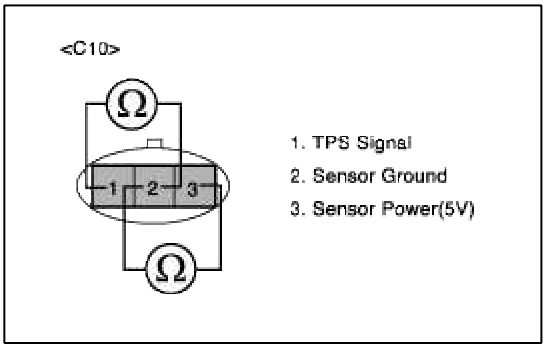
NO

Open circuit between TPS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the TPS connector is disconnected,the voltage of TPS terminal 3 is infinite.
> Possible cause: Open circuit between terminal 17 of PCM and Terminal 3 of TPS

COMPONENT INSPECTION

1. Check TPS
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)
   (2) Measure resistance between terminal 2 and 3 of sensor connector(To sensor side)



   (3) Does each resistance indicate continuity circuit?

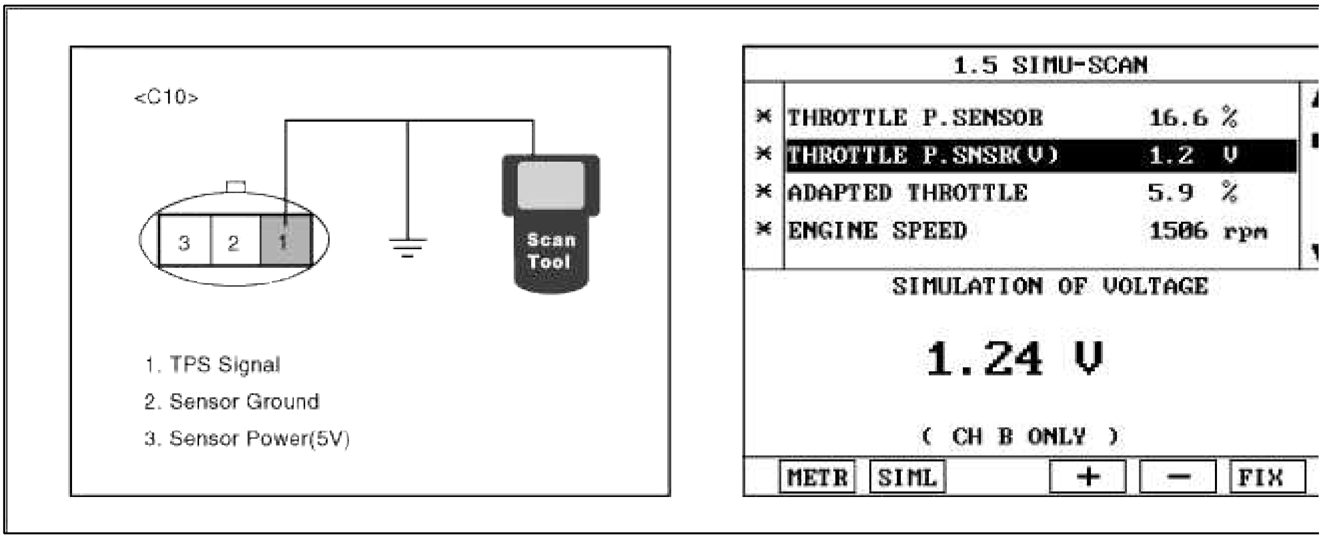
YES

Go to "Check PCM" as below.

NO

Open circuit TPS.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check PCM
   The purpose of checking PCM is to determine whether there is any malfunction of PCM.
   (1) Ignition "OFF"
   (2) Connect Scantool and Engine "ON "
   (3) Select simulation function on scantool.
   (4) Simulate voltage at terminal 1 of TPS sensor signal connector.
   (5) Verify TPS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



```
1.5 SIMU-SCAN
* THROTTLE P.SENSOR      16.6 %
* THROTTLE P.SNSR(V)     1.2  V
* ADAPTED THROTTLE       5.9  %
* ENGINE SPEED           1506 rpm
SIMULATION OF VOLTAGE
1.24 V
( CH B ONLY )
```

   (6) Is TPS signal value changed according to simulation voltage ?

YES

Check TPS for contamination, deterioration, or damage. Clean TPS with suitable cleaner as necessary and dry before reinstalling. If problem still exists, Substitute with a known-good TPS and check for proper operati If the problem is corrected, replace TPS and then go to "Verification of vehicle Repair" procedure

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

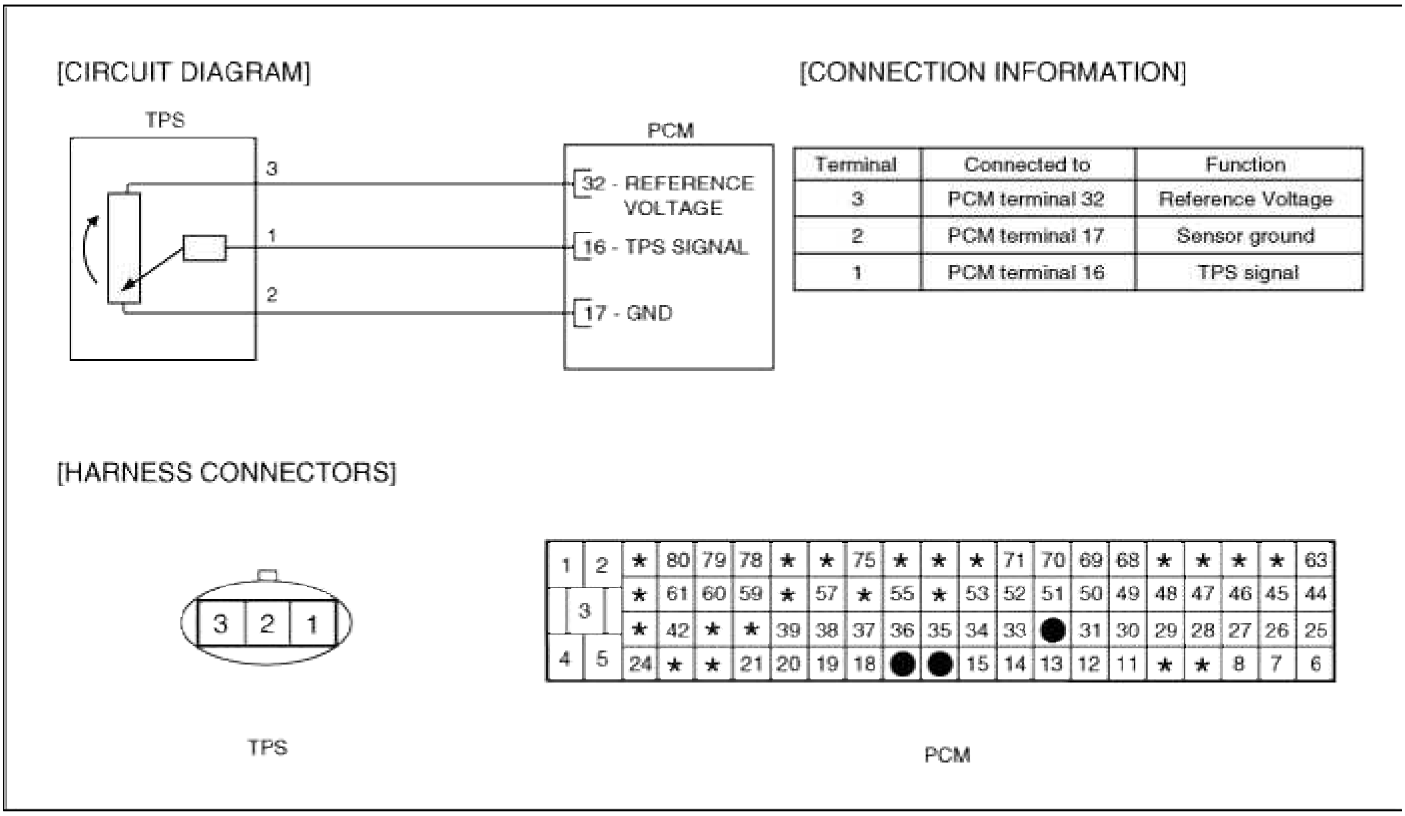
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

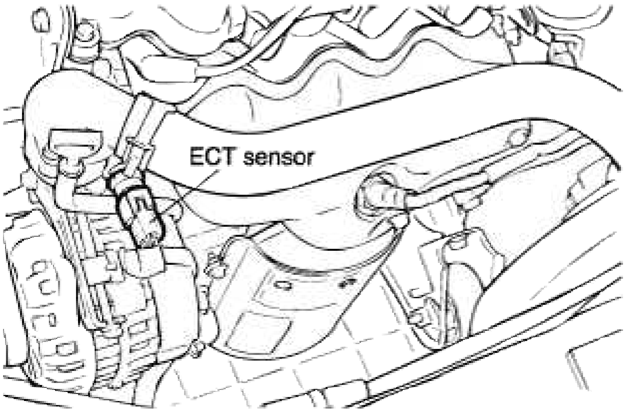

[CIRCUIT DIAGRAM]
TPS
PCM
3
1
2
32 - REFERENCE VOLTAGE
16 - TPS SIGNAL
17 - GND
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
3 2 1
TPS
PCM

Terminal	Connected to	Function
3	PCM terminal 32	Reference Voltage
2	PCM terminal 17	Sensor ground
1	PCM terminal 16	TPS signal

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	●	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	●	●	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0125

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check	● Contaminated, deterriorated or damaged ETCS ● Faulty thermostat ● Foreign materials fouled ETCS ● Open in signal circuit (Supply 4V to pin 39) ● Faulty ECTS ● Faulty PCM
Threshold value	● Temperature is below the certain values after cranking < 15°C(59°F)/5Min -7 ~ -10°C(19.4 ~ 14°F) < 10°C(50°F)/2Min : > 10°C(50°F)	
Enable Conditions	● Forced the closed loop controller activation	
Diagnostic Time		
Fail Safe	● The limp home value of ECTS depends on intake air temperature.	

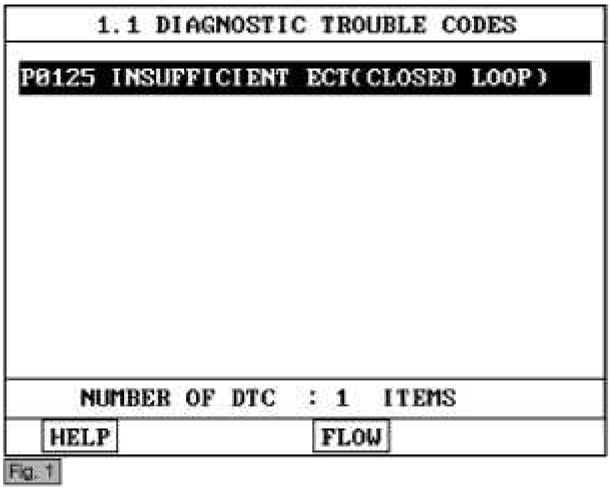
NOTE

If any codes relating to ECTS, IATS circuits are present,do all repairs associated with those codes before proceeding with this troubleshooting procedure.

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "ECTS signal" parameter on the scantool.

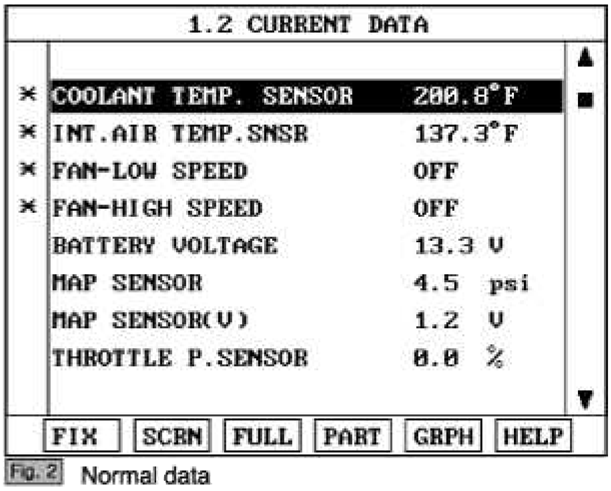


1.1 DIAGNOSTIC TROUBLE CODES

P0125 INSUFFICIENT ECT(CLOSED LOOP)

NUMBER OF DTC : 1 ITEMS

Fig. 1



1.2 CURRENT DATA

*	COOLANT TEMP. SENSOR	200.8°F
*	INT.AIR TEMP.SNSR	137.3°F
*	FAN-LOW SPEED	OFF
*	FAN-HIGH SPEED	OFF
	BATTERY VOLTAGE	13.3 V
	MAP SENSOR	4.5 psi
	MAP SENSOR(V)	1.2 V
	THROTTLE P.SENSOR	0.0 %

Fig. 2 Normal data

NOTE

If the output data changes as temoerature changes,the sensor is good
If the ECTS output is in inverse proportion to water temperature,the sensor is normal.

Service standard
When ECT is 0°C (32°F) : 4.27 ± 0.3 V
When ECT is 20°C(68°F) : 3.44 ± 0.3 V
When ECT is 40°C(104°F) : 2.72 ± 0.3 V
When ECT is 80°C(176°F) : 1.25 ± 0.3 V

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

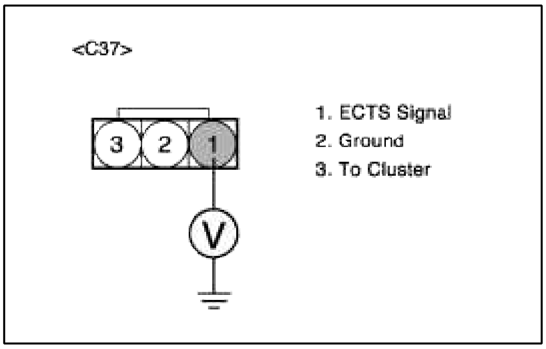
1. Check for open in harness

(1) Ignition "OFF"

(2) Disconnect ETC sensor connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure voltage between terminal 1 of sensor harness connector and chassis ground.



(5) Is measure voltage within Specification?

YES

Go to "Check for short to power in harness " as below.

NO

In case over 5V : Short circuit to battery between ECTS harness connector and PCM harness connector.
In case 0V: Open circuit between ECTS harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

> **NOTE**
>
> In case,when ECTS connector is disconnected,the voltage at terminal 1 is 0V.
> Possible cause : Open or short between Terminal 1 of ETCS connector and terminal 39 of PCM.

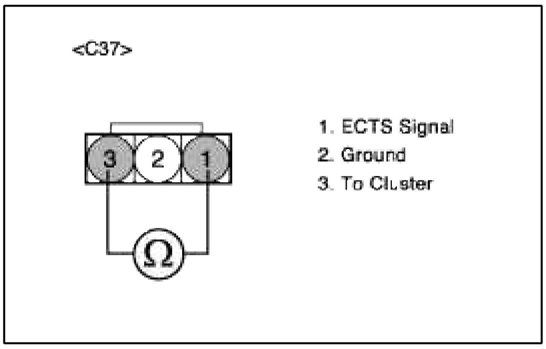
2. Check for short to power in harness

(1) Ignition "OFF"

(2) Disconnect ECT sensor connector and PCM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure resistance between terminal 1 and 3 of sensor harness connector.



(5) Is measure resistance within Specification?

YES

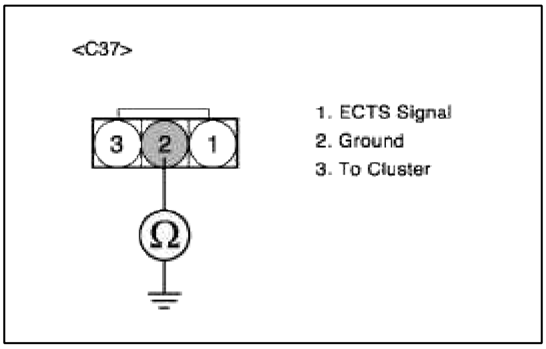
Go to "Ground Circuit Inspection" procedure.

NO

Short circuit between cluster signal circuit and ECTS signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ECT sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between ECTS harness connector and PCM harness connector.
Open circuit between PCM harness connector and chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

> **NOTE**
>
> In case,when measuring resistence of ground circuit,the resistence is over 1ohm.
> Possible cause : Short circuit between ECM ground point and PCM terminal 35

COMPONENT INSPECTION

1. Cooling System inspection
   (1) Check cooling system coolant level and fill if low.
   (2) Check for a proper cooling system operation. Especially check that cooling and condenser fan working normally.
   (3) Remove the thermostat and check the following items:
      1) Stuck or damaged Full open lift : 8.5mm(0.33 in) or more
      2)Verify the temperature at which the valve begins to open.Initial valve opening temperature : 82°C(179.6°F) Full valve opening temperature : 95°C(203°F)
   (4) Is a problem found?

YES

Repair as necessary and go to "Verification vehicle Repair" procedure

NO

Go to "Check ECTS" as below.

2. Check ECTS

(1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)

(2) Does each resistance indicate continuity circuit?

YES

Go to "Check PCM" as below.

NO

Open circuit ECTS .

Repair as necessary and then go to "Verification of Vehicle Repair" procedure

3. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of PCM .

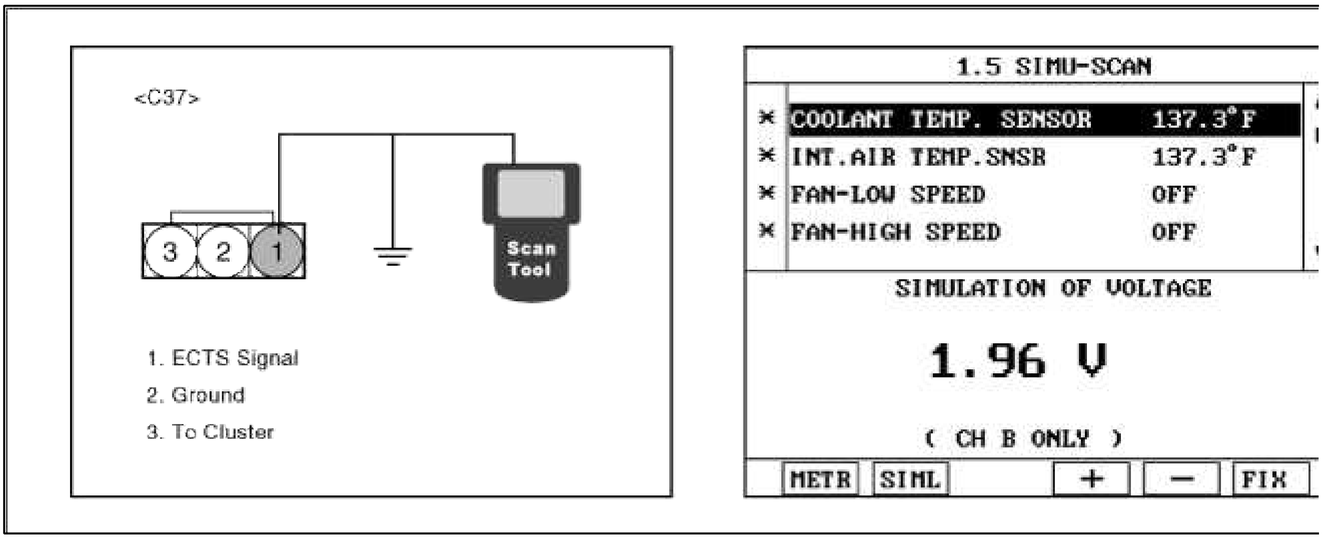
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate voltage at terminal 1 of ECT sensor signal connector.

(5) Verify ECTS voltage to change while raising or lowering simulation voltage with scan tool within 0.5~3.5 V



1.5 SIMU-SCAN

×	COOLANT TEMP. SENSOR	137.3°F
×	INT.AIR TEMP.SNSR	137.3°F
×	FAN-LOW SPEED	OFF
×	FAN-HIGH SPEED	OFF

SIMULATION OF VOLTAGE

1.96 V

(CH B ONLY)

(6) Is ECT sensor signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

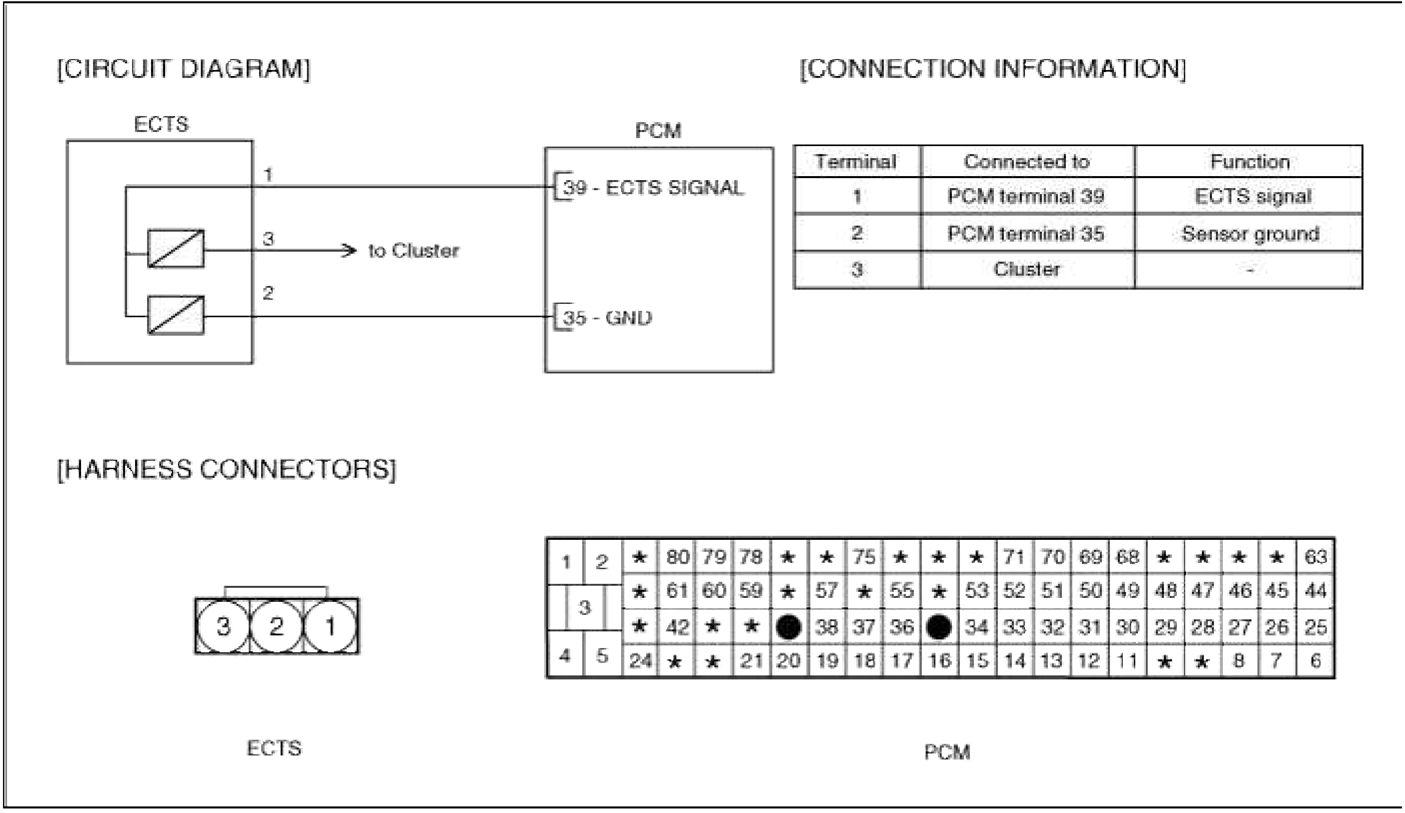
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

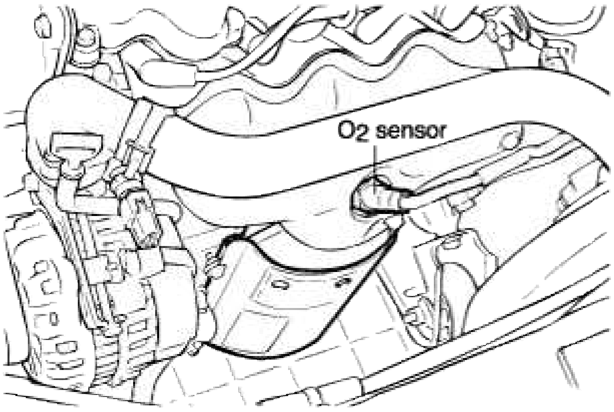

[CIRCUIT DIAGRAM]
ECTS
PCM
1
3
2
to Cluster
39 - ECTS SIGNAL
35 - GND
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
3 2 1
ECTS
PCM

Terminal	Connected to	Function
1	PCM terminal 39	ECTS signal
2	PCM terminal 35	Sensor ground
3	Cluster	-

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	●	38	37	36	●	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0130

COMPONENT LOCATION



GENERAL DESCTIPTION

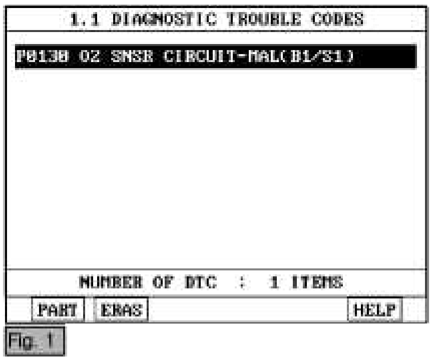
DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
Monitoring Strategy		● Rathionality check	● Open in signal and ground circuit ● Short to battery in control circuit ● Faulty HO2S ● Faulty ECM ● Poor connections between HO2S and PCM ● Misplaced,bent,loose or corroded terminals.
Case1	Threshold value	● Sensor voltage : 0.06 ~ 0.4V	
	Enable Conditions	● Downstream O2 sensor voltage > 0.5 V	
	Diagnostic Time	● 8 sec	
Case2	Threshold value	● Sensor voltage : 0.6-1.08 V	
	Enable Conditions	● Downstream O2 sensor voltage < 0.1 V	
	Diagnostic Time	● 10 sec	
Fail Safe		● None	

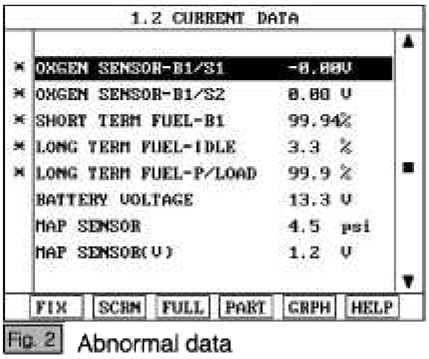
MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S signal" parameter on the scantool.



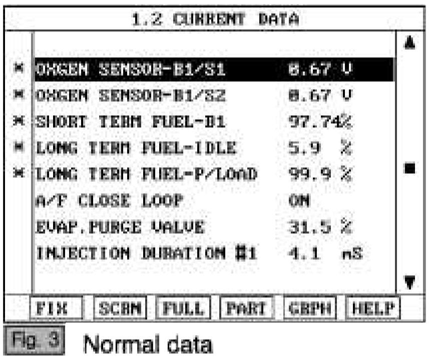
```
1.1 DIAGNOSTIC TROUBLE CODES
P0130 O2 SNSR CIRCUIT-MAL(B1/S1)
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1       -0.00V
* OXGEN SENSOR-B1/S2        0.00 V
* SHORT TERM FUEL-B1       99.94%
* LONG TERM FUEL-IDLE       3.3  %
* LONG TERM FUEL-P/LOAD    99.9  %
  BATTERY VOLTAGE          13.3  V
  MAP SENSOR                4.5  psi
  MAP SENSOR(V)             1.2  V
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1        0.67 V
* OXGEN SENSOR-B1/S2        0.67 V
* SHORT TERM FUEL-B1       97.74%
* LONG TERM FUEL-IDLE       5.9  %
* LONG TERM FUEL-P/LOAD    99.9  %
  A/F CLOSE LOOP            ON
  EVAP.PURGE VALVE         31.5  %
  INJECTION DURATION #1     4.1  mS
```

Fig. 3 Normal data

1.

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
For front HO2S
-When decelerating suddeniy from 4000rpm : 200mV or less
-When engine is suddenly raced : 600~1000mV
-1500rpm : The fluctuation between 400mV or less and 600~1000mV
For Rear HO2S
-Part load(Approx. 2000rpm) : 500~1000mV

2. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

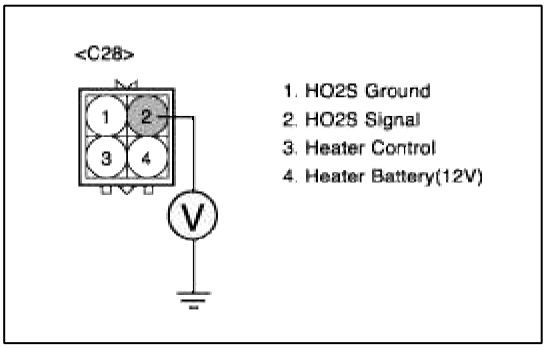
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness(signal)
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector and and chassis ground.



   (5) Is measure voltage within Specification?

YES

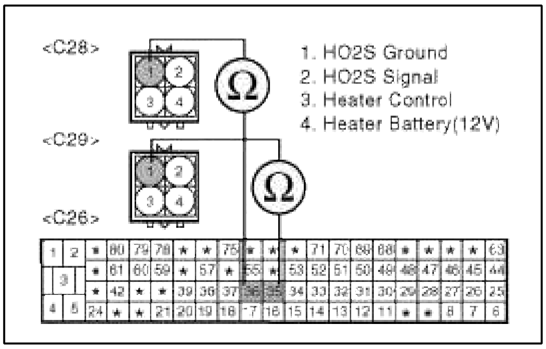
Go to "Check for open in harness(ground) " as below.

NO

Open circuit between HO2S harness connector and ECM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for open in harness(ground)
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 of sensor harness connector and ECM harness connector.


<C28>
<C29>
<C26>
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)
Ω
Ω
1 2 3 4
1 2 3 4
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6

   (5) Is measure resistance within Specification?

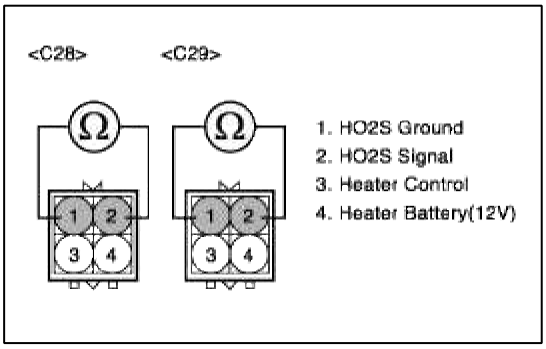
YES

Go to "Check for short to ground in harness" as below.

NO

Open circuit between HO2S harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

3. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 and 2 of sensor harness connector.


<C28>
<C29>
Ω
Ω
1 2 3 4
1 2 3 4
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

   (5) Is measure resistance within Specification?

YES

Go to "Check for short to chassis ground in harness " as below.

NO

Short circuit between HO2S signal circuit and ground circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

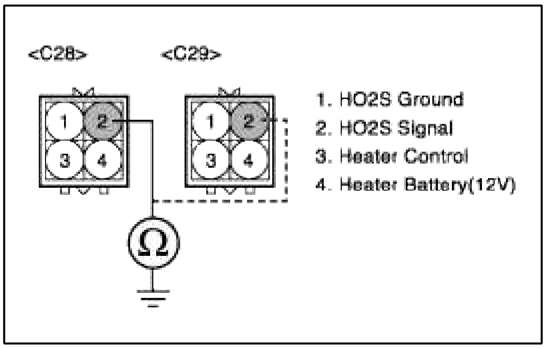
4. Check for short to chassis ground in harness

(1) Ignition "OFF"

(2) Disconnect HO2S sensor connector and PCM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure resistance between terminal 2 of sensor harness connector and chassis ground.



(5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit between HO2S signal circuit and chassis ground.
Short to chassis ground between PCM harness connector and HO2S harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S

(1) Thoroughly check HO2S for contamination,deterioration or damage.

(2) Is HO2S contaminated,deteriorated or damaged?

YES

Substitute with a known-good HO2S and check for proper operation. If the problem is corrected, eplace HO2S and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check PCM" as below.

2. Check ECM

The purpose of checking PCM is to determine whether there is any malfunction of PCM .

(1) Ignition "OFF"

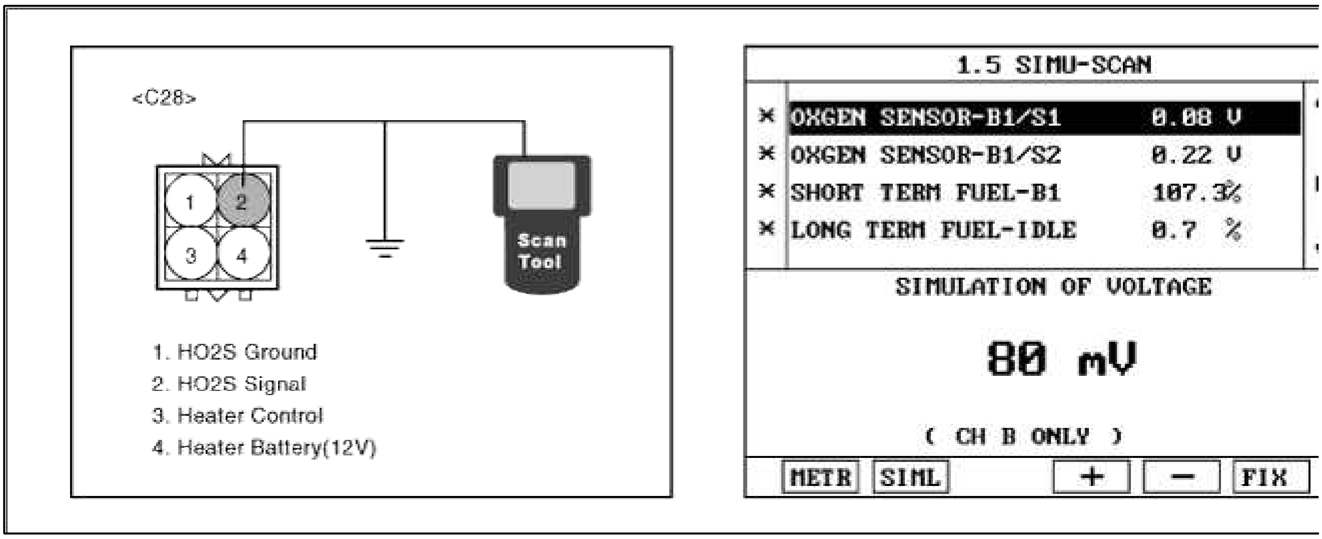
(2) Disconnect HO2S sensor connector.

(3) Connect Scantool and Engine "ON "

(4) Select simulation function on scantool.

(5) Simulate voltage at terminal 2 of HO2S sensor signal connector.

(6) Verify HO2S voltage to change while raising or lowering simulation voltage with scan tool within 0.2 ~ 0.8 V



```
1.5 SIMU-SCAN
× OXGEN SENSOR-B1/S1      0.08 V
× OXGEN SENSOR-B1/S2      0.22 V
× SHORT TERM FUEL-B1      107.3%
× LONG TERM FUEL-IDLE     0.7  %
SIMULATION OF VOLTAGE
80 mV
( CH B ONLY )
```

(7) Is HO2S signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

NOTE

It is not permitted to check the inetrnal resistance of HO2S with analog multimeter.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

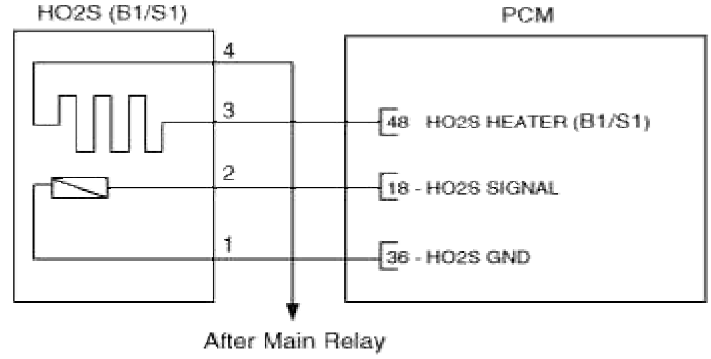
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

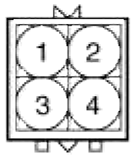
[CIRCUIT DIAGRAM]


HO2S (B1/S1)
PCM
4
3
2
1
48 HO2S HEATER (B1/S1)
18 - HO2S SIGNAL
36 - HO2S GND
After Main Relay

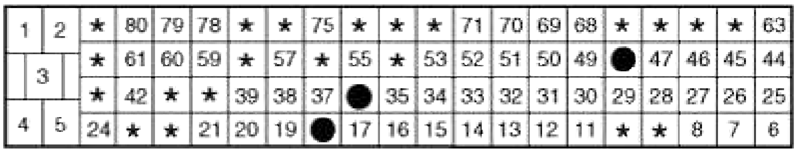
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 36	Ground
2	PCM Terminal 18	HO2S Signal
3	PCM Terminal 48	HO2S Heater (B1/S1)
4	Main Relay	Battery Voltage

[HARNESS CONNECTORS]



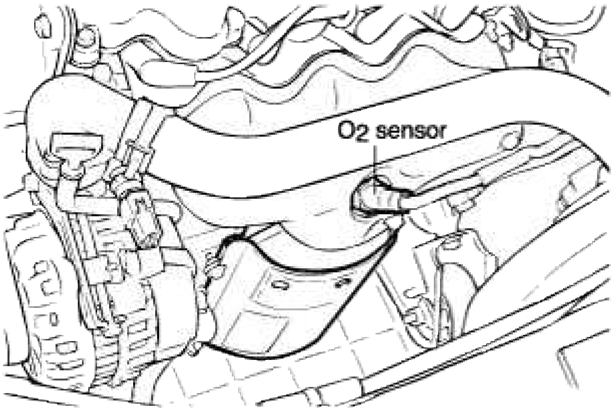
HO2S (B1/S1)


1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 ● 47 46 45 44
★ 42 ★ ★ 39 38 37 ● 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 ● 17 16 15 14 13 12 11 ★ ★ 8 7 6

PCM

Fuel System > Troubleshooting > P0131

COMPONENT LOCATION



GENERAL DESCTIPTION

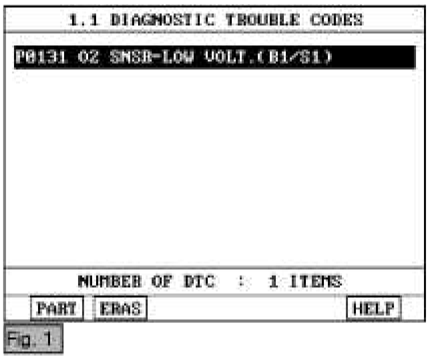
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, low	● Short to ground in control circuit (pin 18 to 36) ● Faulty HO2S ● Faulty PCM
Threshold value	● Sensor voltage : < 0.04V	
Enable Conditions	● Downstream O2 sensor voltage > 0.5 V ● Sensor in cold condition	
Diagnostic Time	● 8 sec ● 0.1 sec	
Fail Safe	● None	

MONITOR DTC STATUS

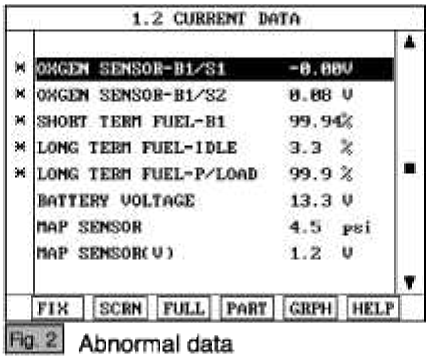
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0131 O2 SNSR-LOW VOLT.(B1/S1)

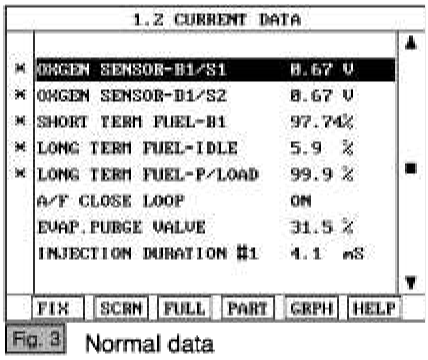
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1        -0.00V
* OXGEN SENSOR-B1/S2        0.08 V
* SHORT TERM FUEL-B1        99.94%
* LONG TERM FUEL-IDLE       3.3  %
* LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.3 V
  MAP SENSOR                4.5  psi
  MAP SENSOR(V)             1.2  V
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1        0.67 V
* OXGEN SENSOR-B1/S2        0.67 V
* SHORT TERM FUEL-B1        97.74%
* LONG TERM FUEL-IDLE       5.9  %
* LONG TERM FUEL-P/LOAD     99.9 %
  A/F CLOSE LOOP            ON
  EVAP.PURGE VALVE          31.5 %
  INJECTION DURATION #1     4.1  mS
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
For front HO2S
-When decelerating suddeniy from 4000rpm : 200mV or less
-When engine is suddenly raced : 600~1000mV
-1500rpm : The fluctuation between 400mV or less and 600~1000mV
For Rear HO2S
-Part load(Approx. 2000rpm) : 500~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

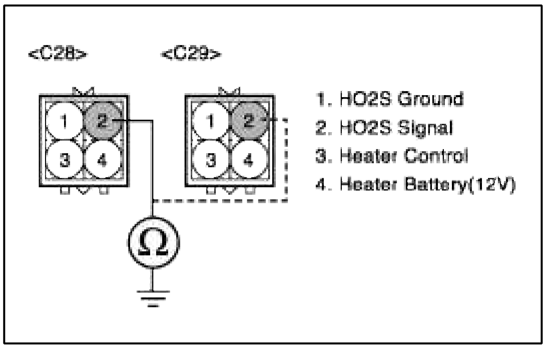
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for short to chassis ground in harness
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 2 of sensor harness connector.


<C28>
<C29>
1
2
3
4
Ω
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

   (5) Is measure resistance within Specification?

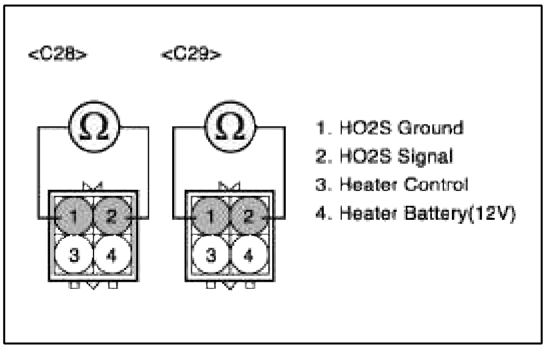
YES

Go to "Check for short to ground in harness " as below.

NO

Short circuit between HO2S signal circuit and chassis ground.
Short to chassis ground between PCM harness connector and HO2S harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 , 2 of sensor harness connector.


<C28>
<C29>
Ω
Ω
1
2
3
4
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

(5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit between HO2S signal circuit and ground circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S

(1) Thoroughly check HO2S for contamination,deterioration or damage.

(2) Is HO2S contaminated,deteriorated or damaged?

YES

Substitute with a known-good HO2S and check for proper operation. If the problem is corrected, eplace HO2S and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check PCM" as below.

2. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of PCM .

(1) Ignition "OFF"

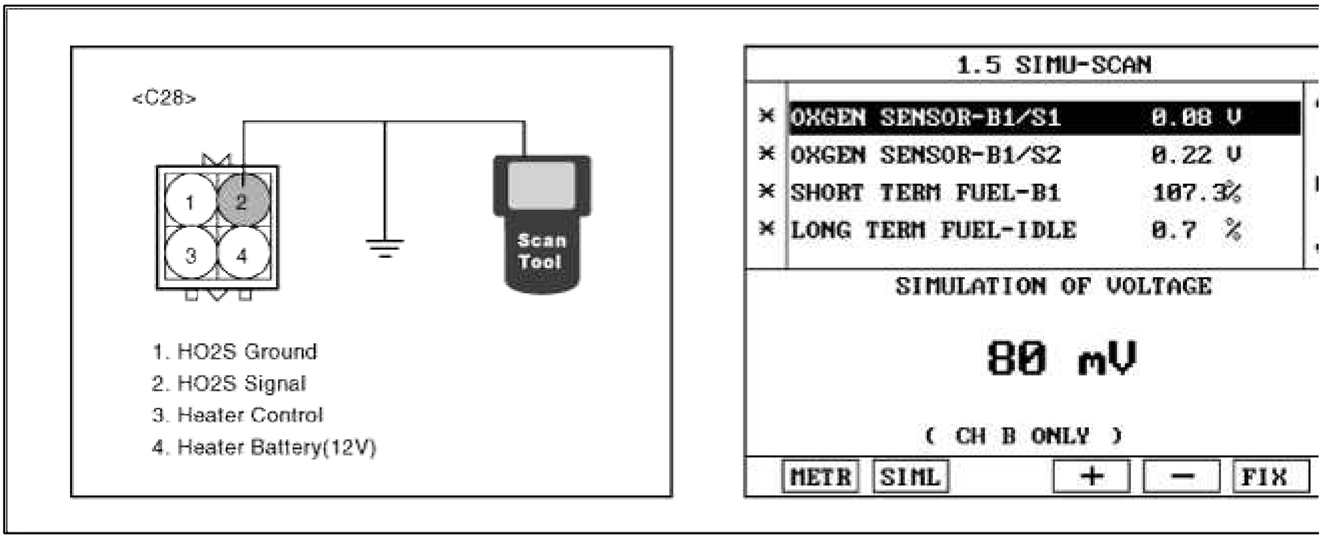
(2) Disconnect HO2S sensor connector.

(3) Connect Scantool and Engine "ON "

(4) Select simulation function on scantool.

(5) Simulate voltage at terminal 2 of HO2S sensor signal connector.

(6) Verify HO2S voltage to change while raising or lowering simulation voltage with scan tool within 0.2 ~ 0.8 V



1.5 SIMU-SCAN

×	OXGEN SENSOR-B1/S1	0.08 V
×	OXGEN SENSOR-B1/S2	0.22 V
×	SHORT TERM FUEL-B1	107.3%
×	LONG TERM FUEL-IDLE	0.7 %

SIMULATION OF VOLTAGE

80 mV

(CH B ONLY)

(7) Is HO2S signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> It is not permitted to check the inetrnal resistance of HO2S with analog multimeter.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

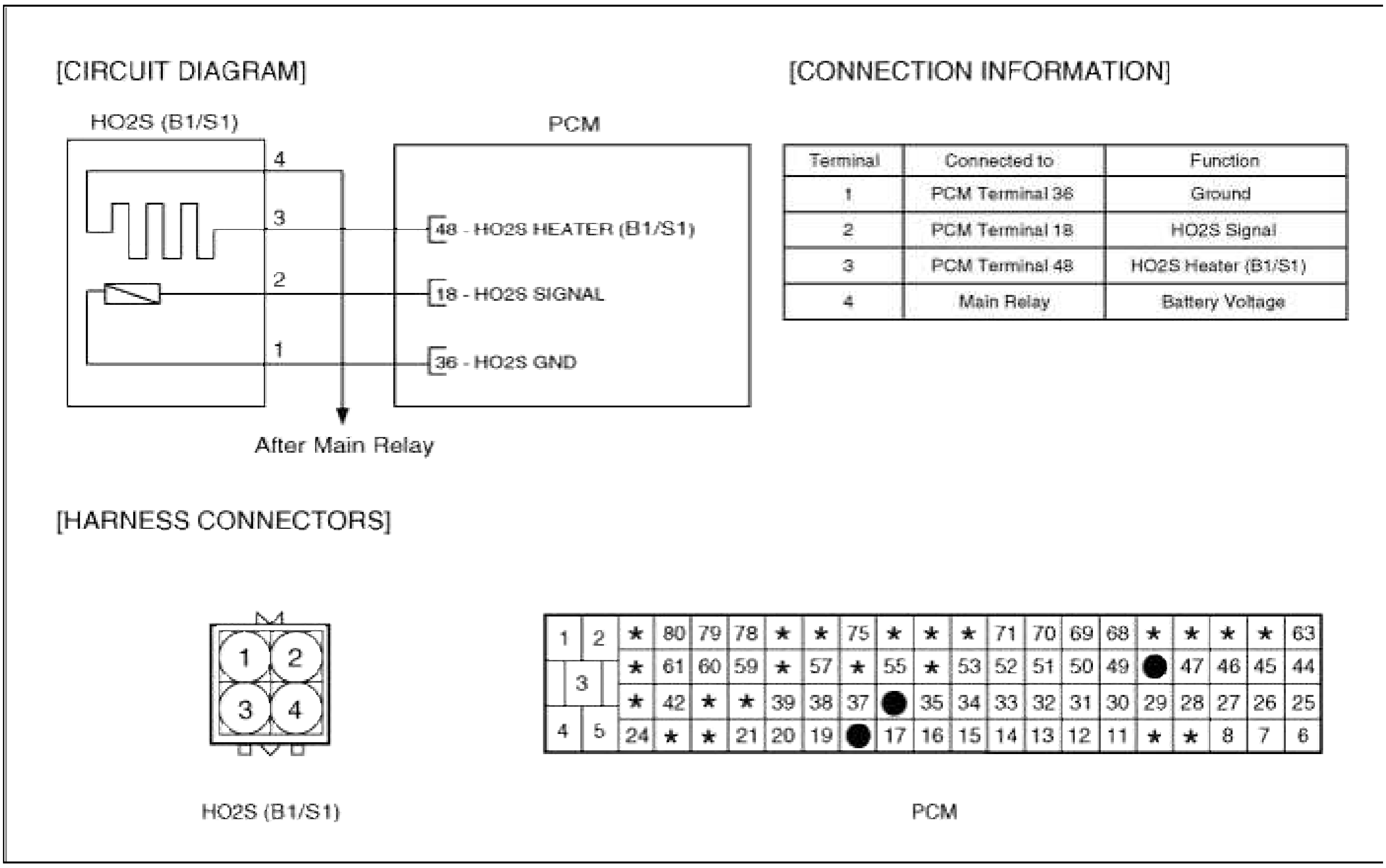
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

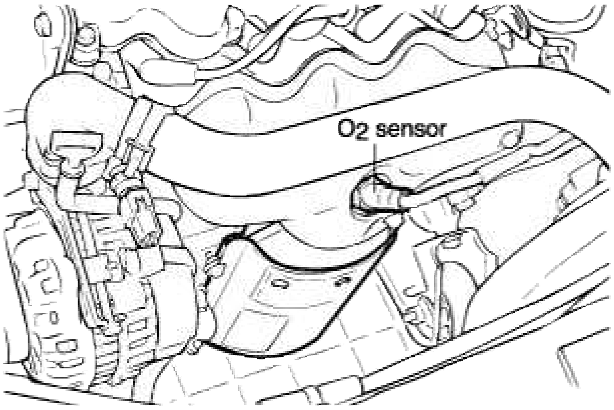
SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
HO2S (B1/S1)
PCM
4
3
2
1
48 - HO2S HEATER (B1/S1)
18 - HO2S SIGNAL
36 - HO2S GND
After Main Relay
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
HO2S (B1/S1)
PCM

Terminal	Connected to	Function
1	PCM Terminal 36	Ground
2	PCM Terminal 18	HO2S Signal
3	PCM Terminal 48	HO2S Heater (B1/S1)
4	Main Relay	Battery Voltage

Fuel System > Troubleshooting > P0132

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

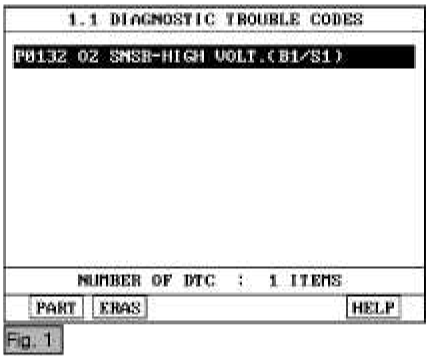
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check , High	● Short to battery in control circuit ● Faulty HO2S ● Faulty PCM
Threshold value	● Sensor voltage : > 1.08V	
Enable Conditions	● Short circuit	
Diagnostic Time	● 5 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

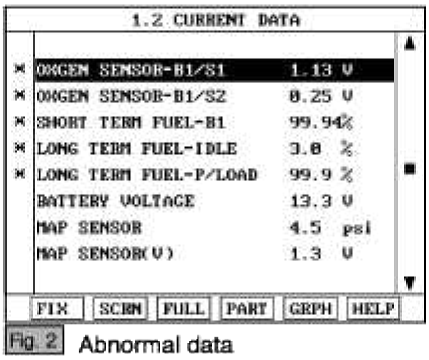
3. Monitor the "HO2S signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0132 O2 SNSR-HIGH VOLT.(B1/S1)

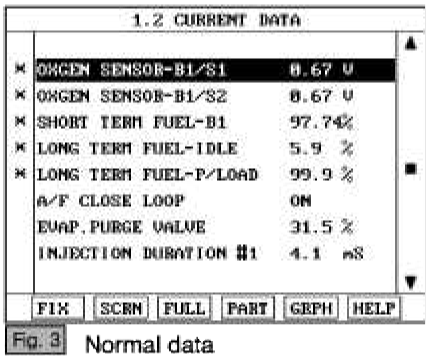
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1          1.13 V
* OXGEN SENSOR-B1/S2          0.25 V
* SHORT TERM FUEL-B1          99.94%
* LONG TERM FUEL-IDLE         3.0  %
* LONG TERM FUEL-P/LOAD       99.9 %
  BATTERY VOLTAGE             13.3 V
  MAP SENSOR                  4.5  psi
  MAP SENSOR(V)               1.3  V
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1          0.67 V
* OXGEN SENSOR-B1/S2          0.67 V
* SHORT TERM FUEL-B1          97.74%
* LONG TERM FUEL-IDLE         5.9  %
* LONG TERM FUEL-P/LOAD       99.9 %
  A/F CLOSE LOOP              ON
  EVAP.PURGE VALVE            31.5 %
  INJECTION DURATION #1       4.1  mS
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard

For front HO2S

-When decelerating suddeniy from 4000rpm : 200mV or less

-When engine is suddenly raced : 600~1000mV

-1500rpm : The fluctuation between 400mV or less and 600~1000mV

For Rear HO2S

-Part load(Approx. 2000rpm) : 500~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

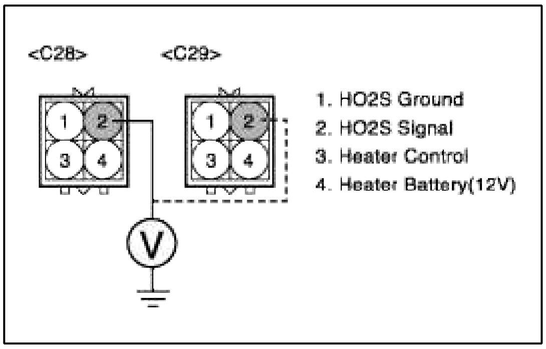
SIGNAL CIRCUIT INSPECTION

1. Check for short to power in harness
   (1) Ignition "OFF"

   (2) Disconnect HO2S sensor connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 2 of sensor harness connector.



   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit to battery between HO2S harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when HO2S harness connector disconnected,the output voltage at terminal 2 is 12V.
Possible cause: Short circuit to battery in harness between E/R-J/BOX and terminal 2 of HO2S heater.

COMPONENT INSPECTION

1. Check HO2S
   (1) Thoroughly check HO2S for contamination,deterioration or damage.

   (2) Is HO2S contaminated,deteriorated or damaged?

YES

Substitute with a known-good HO2S and check for proper operation. If the problem is corrected, eplace HO2S and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check PCM" as below.

2. Check ECM

The purpose of checking PCM is to determine whether there is any malfunction of PCM .

(1) Ignition "OFF"

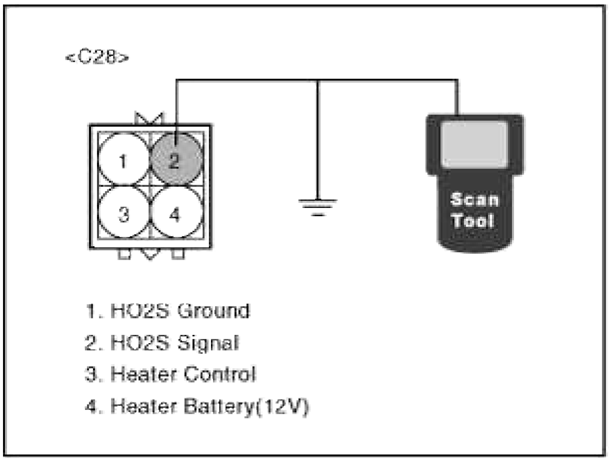
(2) Disconnect HO2S sensor connector.

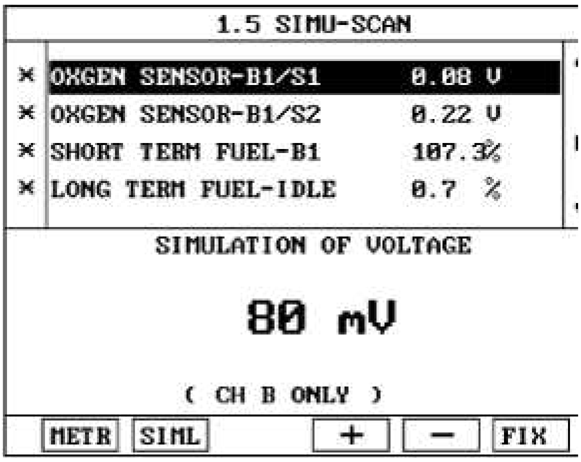
(3) Connect Scantool and Engine "ON "

(4) Select simulation function on scantool.

(5) Simulate voltage at terminal 2 of HO2S sensor signal connector.

(6) Verify HO2S voltage to change while raising or lowering simulation voltage with scan tool within 0.2 ~ 0.8 V





```
1.5 SIMU-SCAN
× OXGEN SENSOR-B1/S1      0.08 V
× OXGEN SENSOR-B1/S2      0.22 V
× SHORT TERM FUEL-B1      107.3%
× LONG TERM FUEL-IDLE     0.7  %
SIMULATION OF VOLTAGE
80 mV
( CH B ONLY )
```

(7) Is HO2S signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

NOTE

It is not permitted to check the inetrnal resistance of HO2S with analog multimeter.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

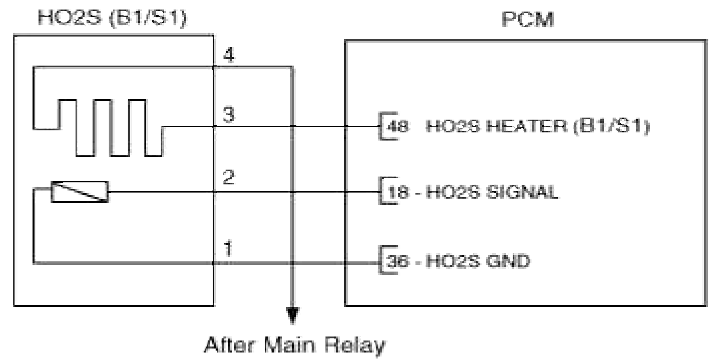
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

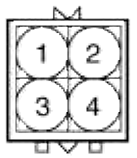
[CIRCUIT DIAGRAM]


HO2S (B1/S1)
PCM
4
3
2
1
48 HO2S HEATER (B1/S1)
18 - HO2S SIGNAL
36 - HO2S GND
After Main Relay

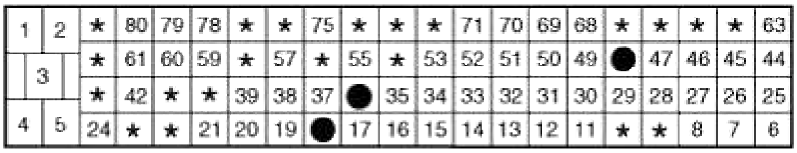
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 36	Ground
2	PCM Terminal 18	HO2S Signal
3	PCM Terminal 48	HO2S Heater (B1/S1)
4	Main Relay	Battery Voltage

[HARNESS CONNECTORS]



HO2S (B1/S1)

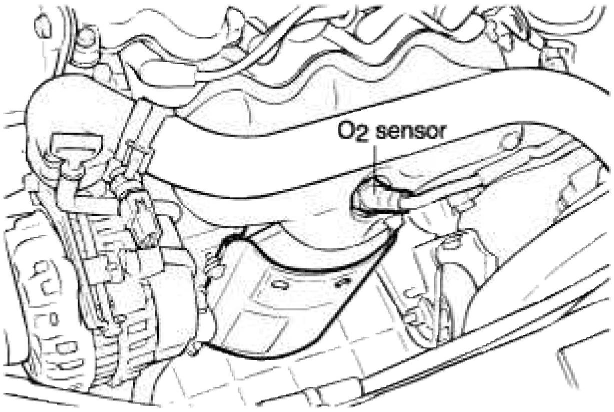


1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	●	47	46	45	44
		★	42	★	★	39	38	37	●	35	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	●	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Fuel System > Troubleshooting > P0133

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

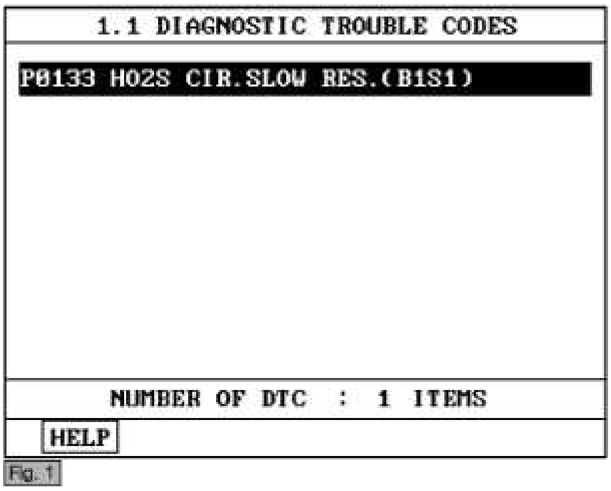
Item	Detecting Condition	Possible cause
Monitoring Strategy	● Response rate	● Abnormal combustion ● Improper fuel pressure ● Front and rear HO2S connectors reversed. ● Faulty fuel delivery system. ● Leak in intake system. ● Leak in exhaust system. ● Faulty HO2S. ● Faulty PCM
Threshold value	● Average period of 9 oscillation signal : >2.8 sec	
Enable Conditions	● Engine speed 1800-2800 rpm ● Engine load 35-75 % ● Catalyst temperature > 450 degC(842 °F)	
Diagnostic Time		
Fail Safe	● None	

NOTE

If any misfire,purge solenoid valve,MAP or HO2S heater codes are present,do all repairs associated with those codes before proceeding this troubleshooting procedure.

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S signal" parameter on the scantool.

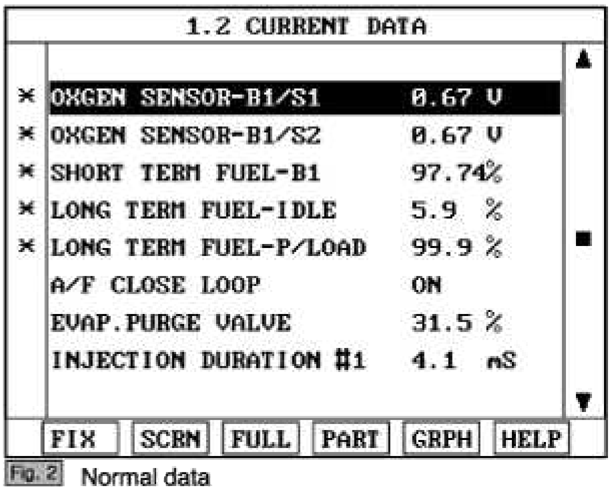


```
1.1 DIAGNOSTIC TROUBLE CODES

P0133 HO2S CIR.SLOW RES.(B1S1)

NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1      0.67 V
* OXGEN SENSOR-B1/S2      0.67 V
* SHORT TERM FUEL-B1      97.74%
* LONG TERM FUEL-IDLE     5.9  %
* LONG TERM FUEL-P/LOAD   99.9 %
  A/F CLOSE LOOP          ON
  EVAP.PURGE VALVE        31.5 %
  INJECTION DURATION #1   4.1  mS
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard

For front HO2S

-When decelerating suddeniy from 4000rpm : 200mV or less

-When engine is suddenly raced : 600~1000mV

-1500rpm : The fluctuation between 400mV or less and 600~1000mV

For Rear HO2S

-Part load(Approx. 2000rpm) : 500~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Check for Exhaust system

(1) Visually check for leak from exhaust system (especially between TWC converter and front exhaust pipe).

(2) Are any leaks present?

YES

Go to "Compression test " as below.

NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for Intake system

Check intake system for leaks, cracks, loose connection as follwing items :

(1) Throttle body gasket.

(2) Gasket between intake manifold and surge tank.

(3) Seals between intake manifold and fuel injectors.

(4) Seals between surge tank and PCV valves..

(5) Are any vacuum leaks present?

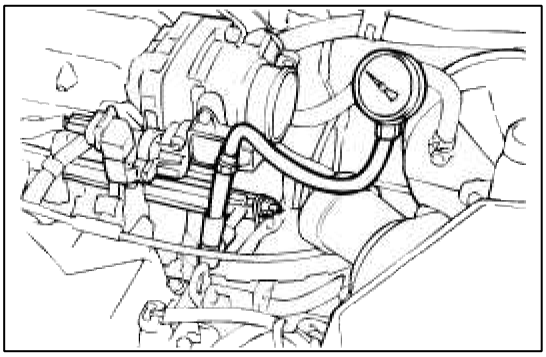
YES

Go to "Check for fuel pressure " as below.

NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

3. Check for fuel pressure
   (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.
   (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.
   (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.
   (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.
   (5) Start an engine and warm up to operating temperature.
   (6) Check for fuel pressure at idle.



   (7) Is fuel pressure within specification?

YES

Go to "Component Inspection" procedure.

NO

Check fuel delivery system.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S
   (1) Thoroughly check HO2S for contamination,deterioration or damage.
   (2) Is HO2S contaminated,deteriorated or damaged?

YES

Substitute with a known-good HO2S and check for proper operation. If the problem is corrected, eplace HO2S and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check PCM" as below.

2. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of PCM .

(1) Ignition "OFF"

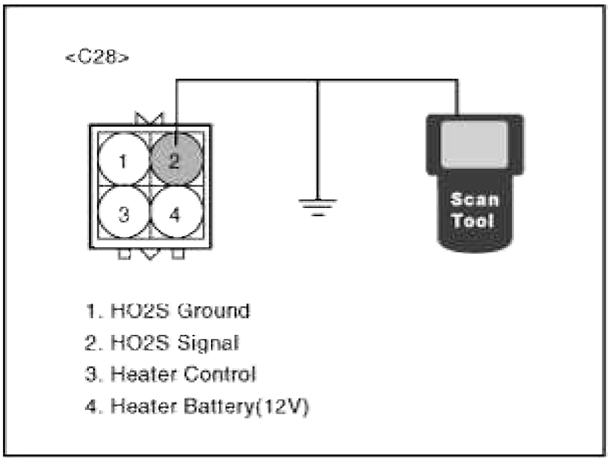
(2) Disconnect HO2S sensor connector.

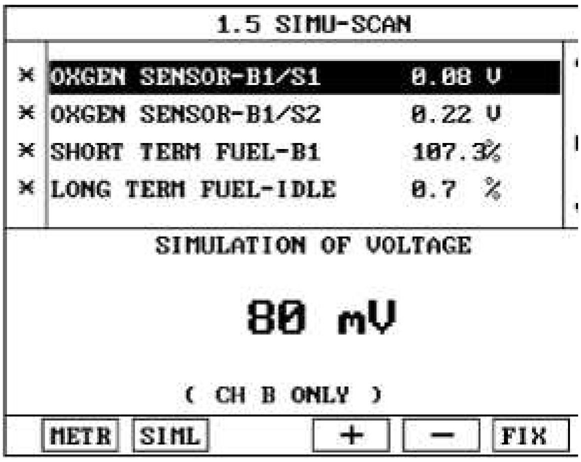
(3) Connect Scantool and Engine "ON "

(4) Select simulation function on scantool.

(5) Simulate voltage at terminal 2 of HO2S sensor signal connector.

(6) Verify HO2S voltage to change while raising or lowering simulation voltage with scan tool within 0.2 ~ 0.8 V





```
1.5 SIMU-SCAN
× OXGEN SENSOR-B1/S1      0.08 V
× OXGEN SENSOR-B1/S2      0.22 V
× SHORT TERM FUEL-B1      107.3%
× LONG TERM FUEL-IDLE     0.7  %
SIMULATION OF VOLTAGE
80 mV
( CH B ONLY )
```

(7) Is HO2S signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

NOTE

It is not permitted to check the inetrnal resistance of HO2S with analog multimeter.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

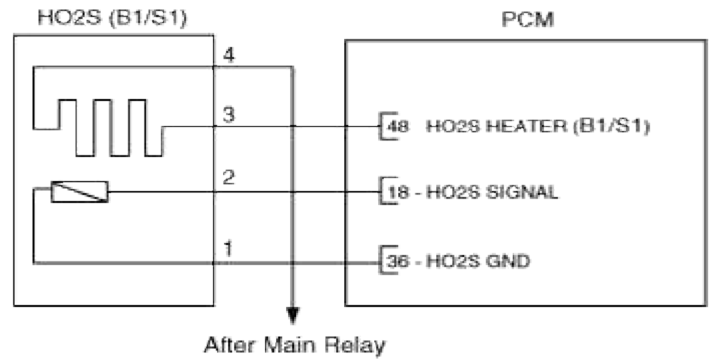
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

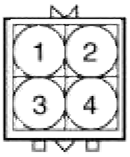
[CIRCUIT DIAGRAM]


HO2S (B1/S1)
PCM
4
3
2
1
48 HO2S HEATER (B1/S1)
18 - HO2S SIGNAL
36 - HO2S GND
After Main Relay

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 36	Ground
2	PCM Terminal 18	HO2S Signal
3	PCM Terminal 48	HO2S Heater (B1/S1)
4	Main Relay	Battery Voltage

[HARNESS CONNECTORS]



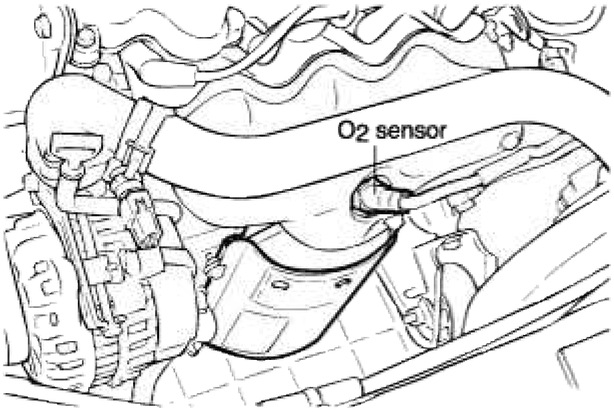
HO2S (B1/S1)

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	●	47	46	45	44
		★	42	★	★	39	38	37	●	35	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	●	17	16	15	14	13	12	11	★	★	8	7	6

PCM

Fuel System > Troubleshooting > P0134

COMPONENT LOCATION



GENERAL DESCTIPTION

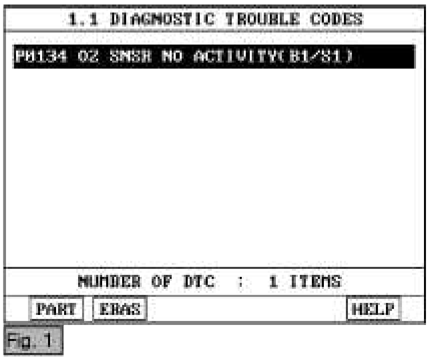
DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
Monitoring Strategy		● Signal check, wiring interruption	● Open in signal and ground circuit ● Faulty HO2S ● Faulty PCM ● Poor connections between HO2S and ECM ● Misplaced,bent,loose or corroded terminals.
Case1	Threshold value	● Sensor voltage : > 0.2V	
	Enable Conditions	● During fuel cut-off ● Downstream O2 sensor voltage > 0.2 V	
	Diagnostic Time	● 3 sec	
Case2	Threshold value	● Sensor voltage : > 0.4 ~ 0.6V	
	Enable Conditions		
	Diagnostic Time	● 5 sec	
Fail Safe		● None	

MONITOR DTC STATUS

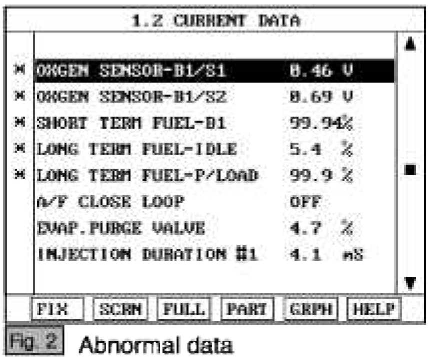
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0134 O2 SNSR NO ACTIVITY(B1/S1)

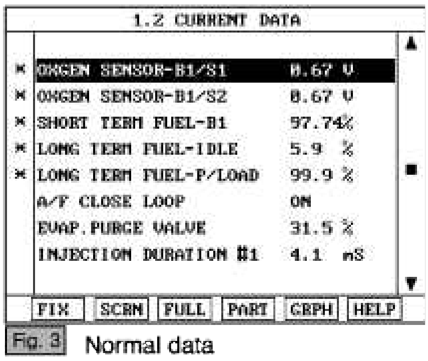
NUMBER OF DTC   :   1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1        0.46 V
* OXGEN SENSOR-B1/S2        0.69 V
* SHORT TERM FUEL-B1        99.94%
* LONG TERM FUEL-IDLE       5.4  %
* LONG TERM FUEL-P/LOAD     99.9 %
  A/F CLOSE LOOP            OFF
  EVAP.PURGE VALVE          4.7  %
  INJECTION DURATION #1     4.1  mS
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1        0.67 V
* OXGEN SENSOR-B1/S2        0.67 V
* SHORT TERM FUEL-B1        97.74%
* LONG TERM FUEL-IDLE       5.9  %
* LONG TERM FUEL-P/LOAD     99.9 %
  A/F CLOSE LOOP            ON
  EVAP.PURGE VALVE          31.5 %
  INJECTION DURATION #1     4.1  mS
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard

For front HO2S

-When decelerating suddeniy from 4000rpm : 200mV or less

-When engine is suddenly raced : 600~1000mV

-1500rpm : The fluctuation between 400mV or less and 600~1000mV

For Rear HO2S

-Part load(Approx. 2000rpm) : 500~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

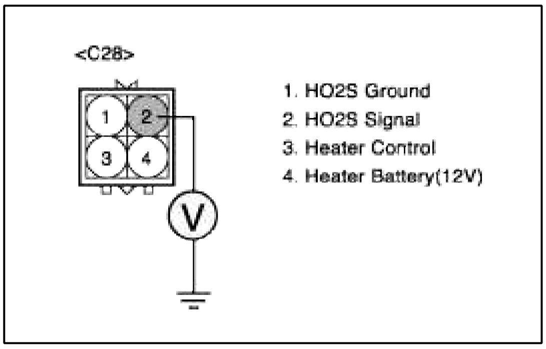
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness(signal)
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector and and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Check for open in harness(ground) " as below.

NO

Open circuit between HO2S harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

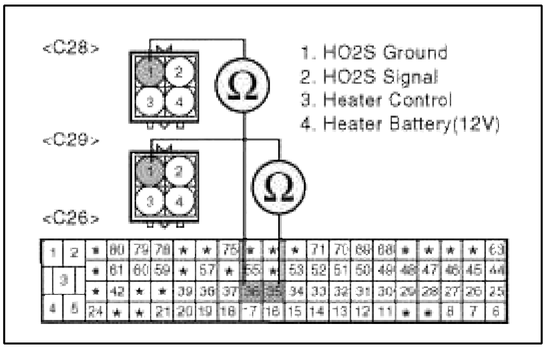
2. Check for open in harness(ground)

(1) Ignition "OFF"

(2) Disconnect HO2S sensor connector and PCM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure resistance between terminal 1 of sensor harness connector and ECM harness connector.



(5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between HO2S harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S

(1) Thoroughly check HO2S for contamination,deterioration or damage.

(2) Is HO2S contaminated,deteriorated or damaged?

YES

Substitute with a known-good HO2S and check for proper operation. If the problem is corrected, eplace HO2S and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check PCM" as below.

2. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of ECM.

(1) Ignition "OFF"

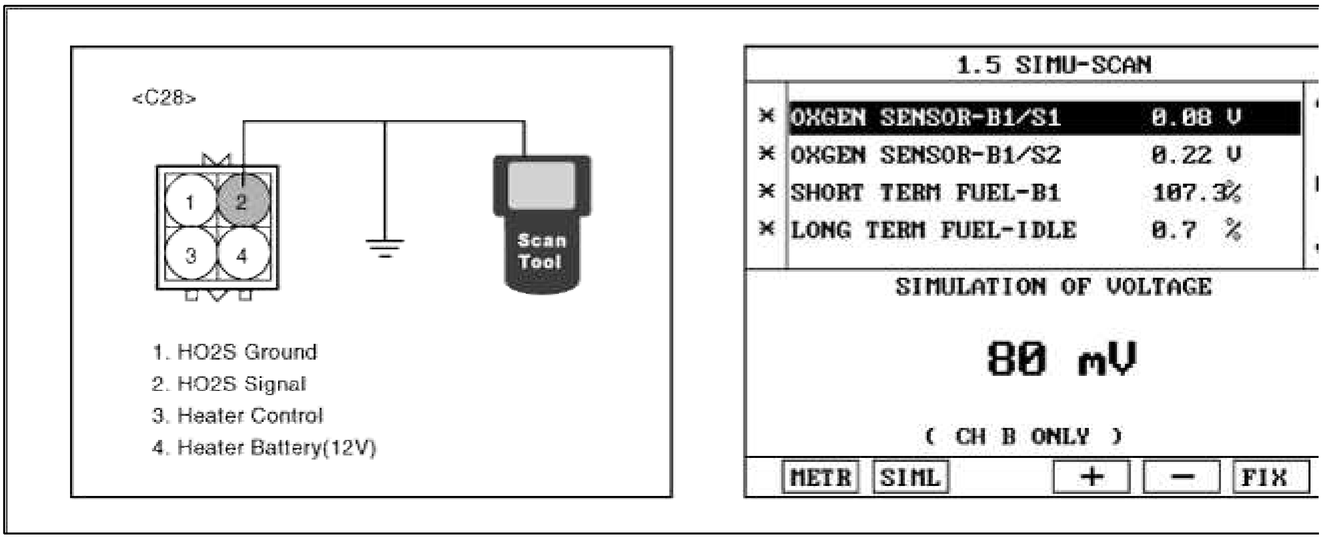
(2) Disconnect HO2S sensor connector.

(3) Connect Scantool and Engine "ON "

(4) Select simulation function on scantool.

(5) Simulate voltage at terminal 2 of HO2S sensor signal connector.

(6) Verify HO2S voltage to change while raising or lowering simulation voltage with scan tool within 0.2 ~ 0.8 V



```
1.5 SIMU-SCAN
× OXGEN SENSOR-B1/S1      0.08 V
× OXGEN SENSOR-B1/S2      0.22 V
× SHORT TERM FUEL-B1      107.3%
× LONG TERM FUEL-IDLE     0.7  %
       SIMULATION OF VOLTAGE
              80 mV
          ( CH B ONLY )
```

(7) Is HO2S signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> It is not permitted to check the inetrnal resistance of HO2S with analog multimeter.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

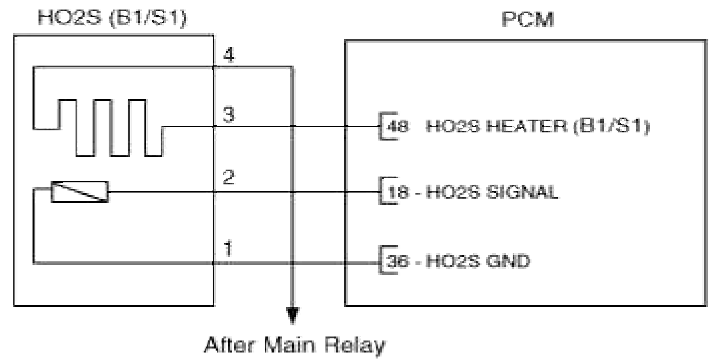
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

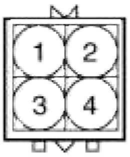
[CIRCUIT DIAGRAM]


HO2S (B1/S1)
PCM
4
3
2
1
48 HO2S HEATER (B1/S1)
18 - HO2S SIGNAL
36 - HO2S GND
After Main Relay

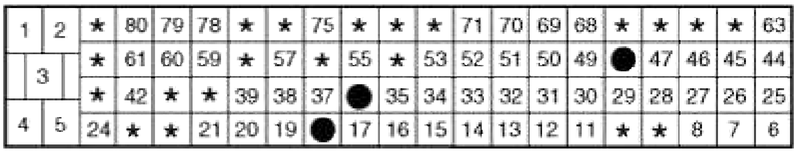
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 36	Ground
2	PCM Terminal 18	HO2S Signal
3	PCM Terminal 48	HO2S Heater (B1/S1)
4	Main Relay	Battery Voltage

[HARNESS CONNECTORS]



HO2S (B1/S1)



PCM

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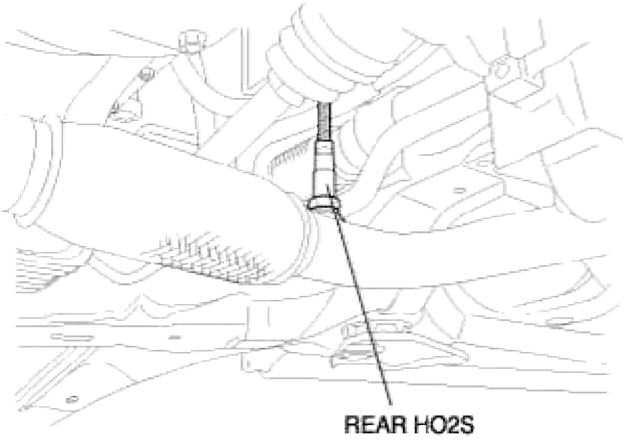
COMPONENT LOCATION



GENERAL DESCTIPTION

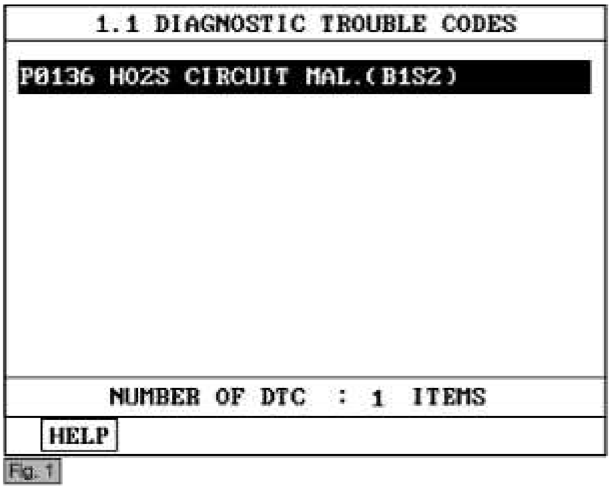
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Rationality check	● Open HO2S ● Short HO2S ● Faulty HO2S . ● Faulty PCM . ● Poor connections between HO2S and ECM. ● Misplaced,bent,loose or corroded terminals.
Threshold value	● Counter of ushk > 1.25V during 0.05sec after heater on-> off : > 5 times	
Enable Conditions	● No signal check high error ● Heater on->off counter > 10 times	
Diagnostic Time		
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S signal" parameter on the scantool.

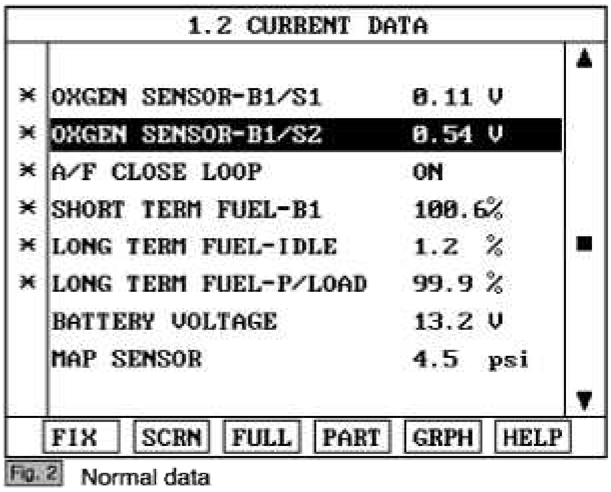


```
1.1 DIAGNOSTIC TROUBLE CODES

P0136 HO2S CIRCUIT MAL.(B1S2)

NUMBER OF DTC  :  1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1      0.11 V
* OXGEN SENSOR-B1/S2      0.54 V
* A/F CLOSE LOOP          ON
* SHORT TERM FUEL-B1      100.6%
* LONG TERM FUEL-IDLE     1.2  %
* LONG TERM FUEL-P/LOAD   99.9 %
  BATTERY VOLTAGE         13.2 V
  MAP SENSOR              4.5  psi
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard

For front HO2S

-When decelerating suddeniy from 4000rpm : 200mV or less

-When engine is suddenly raced : 600~1000mV

-1500rpm : The fluctuation between 400mV or less and 600~1000mV

For Rear HO2S

-Part load(Approx. 2000rpm) : 500~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

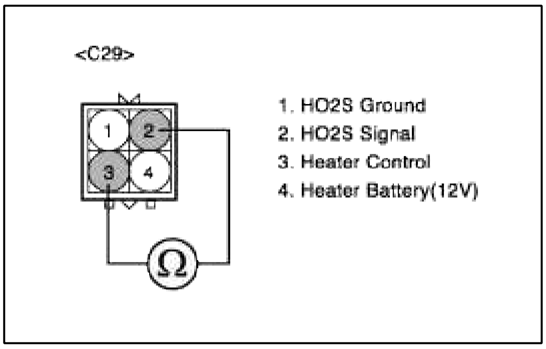
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for short to heater control in harness
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 2 , 3 of sensor harness connector.



   (5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit between HO2S signal circuit and heater control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S
   (1) Thoroughly check HO2S for contamination,deterioration or damage.
   (2) Is HO2S contaminated,deteriorated or damaged?

YES

Substitute with a known-good HO2S and check for proper operation. If the problem is corrected, eplace HO2S and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check PCM" as below.

2. Check PCM

The purpose of checking PCM is to determine whether there is any malfunction of PCM.

(1) Ignition "OFF"

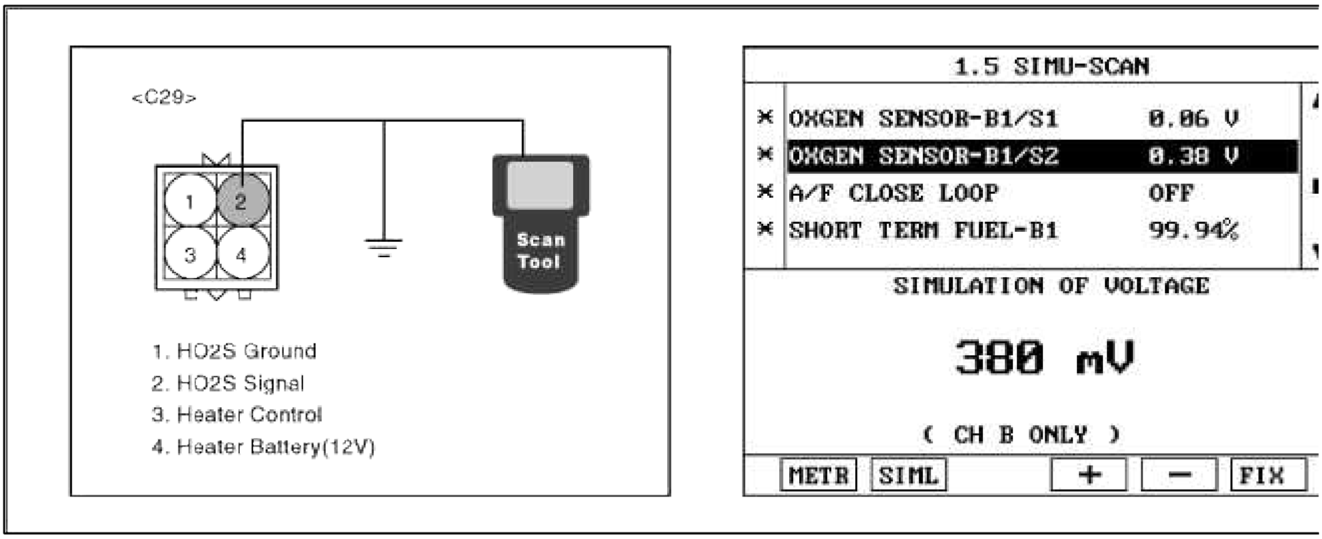
(2) Disconnect HO2S sensor connector.

(3) Connect Scantool and Engine "ON "

(4) Select simulation function on scantool.

(5) Simulate voltage at terminal 2 of HO2S sensor signal connector.

(6) Verify HO2S voltage to change while raising or lowering simulation voltage with scan tool within 0.2 ~ 0.8 V



```
1.5 SIMU-SCAN
* OXGEN SENSOR-B1/S1      0.06 V
* OXGEN SENSOR-B1/S2      0.38 V
* A/F CLOSE LOOP          OFF
* SHORT TERM FUEL-B1      99.94%
     SIMULATION OF VOLTAGE

           380 mV

        ( CH B ONLY )
```

(7) Is HO2S signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> It is not permitted to check the inetrnal resistance of HO2S with analog multimeter.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

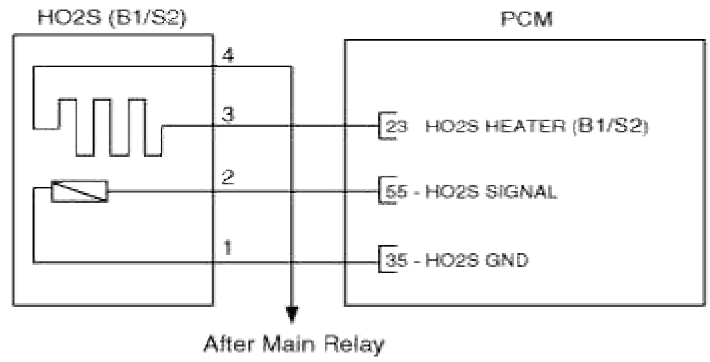
Go to the applicable troubleshooting procedure.

NO

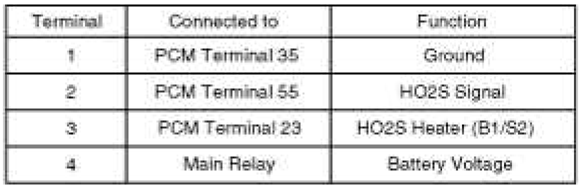
System is performing to specification at this time.

SCHEMATIC DIAGRAM

[CIRCUIT DIAGRAM]

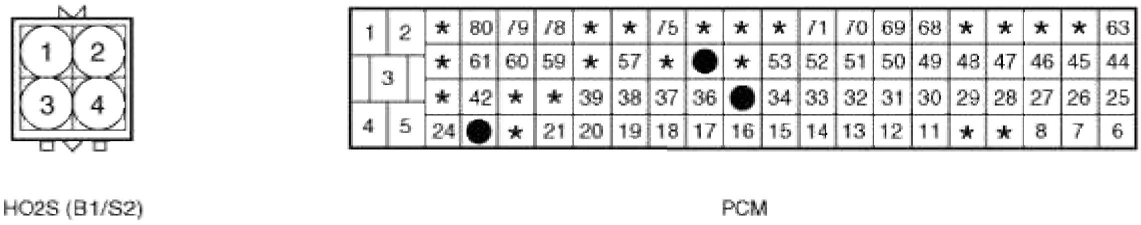

HO2S (B1/S2)
PCM
4
3
2
1
23 HO2S HEATER (B1/S2)
55 - HO2S SIGNAL
35 - HO2S GND
After Main Relay

[CONNECTION INFORMATION]



Terminal	Connected to	Function
1	PCM Terminal 35	Ground
2	PCM Terminal 55	HO2S Signal
3	PCM Terminal 23	HO2S Heater (B1/S2)
4	Main Relay	Battery Voltage

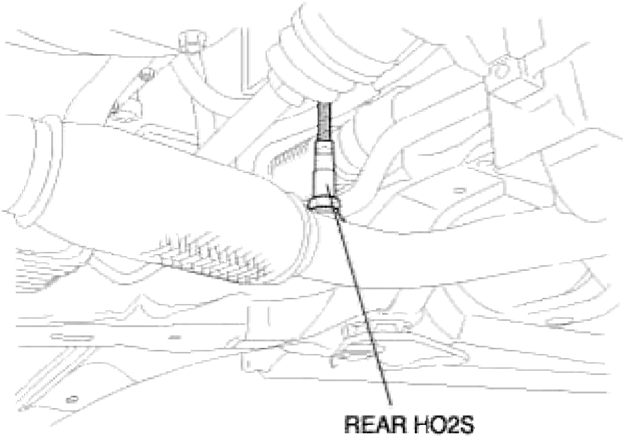
[HARNESS CONNECTORS]


1
2
3
4
HO2S (B1/S2)
PCM

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	●	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	●	34	33	32	31	30	29	28	27	26	25
4	5	24	●	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0137

COMPONENT LOCATION



GENERAL DESCTIPTION

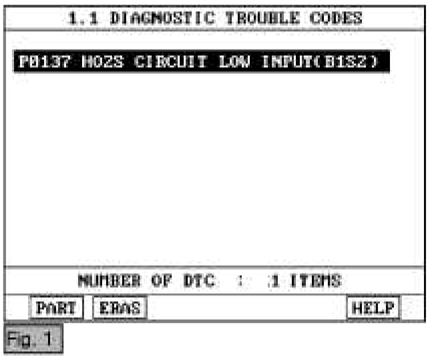
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, low	● Short to ground in control circuit (pin 55 to 35) ● Faulty HO2S ● Faulty PCM
Threshold value	●Sensor voltage : < 0.04V	
Enable Conditions	● Short circuit	
Diagnostic Time	● 5 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S signal" parameter on the scantool.

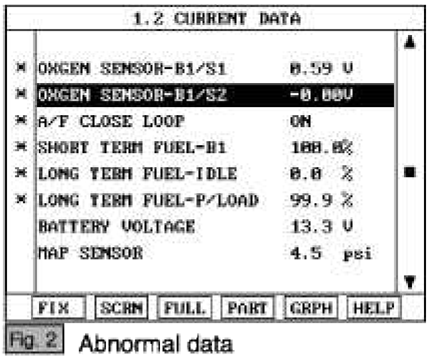


```
1.1 DIAGNOSTIC TROUBLE CODES

P0137 HO2S CIRCUIT LOW INPUT(B1S2)

NUMBER OF DTC  :  1 ITEMS
```

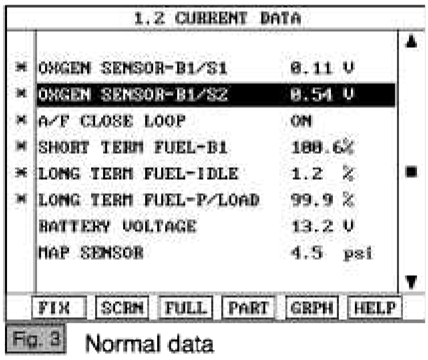
Fig. 1



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1        0.59 V
* OXGEN SENSOR-B1/S2        -0.00V
* A/F CLOSE LOOP            ON
* SHORT TERM FUEL-B1        100.0%
* LONG TERM FUEL-IDLE       0.0  %
* LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.3 V
  MAP SENSOR                4.5  psi
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1        0.11 V
* OXGEN SENSOR-B1/S2        0.54 V
* A/F CLOSE LOOP            ON
* SHORT TERM FUEL-B1        100.6%
* LONG TERM FUEL-IDLE       1.2  %
* LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.2 V
  MAP SENSOR                4.5  psi
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
For front HO2S
-When decelerating suddeniy from 4000rpm : 200mV or less
-When engine is suddenly raced : 600~1000mV
-1500rpm : The fluctuation between 400mV or less and 600~1000mV
For Rear HO2S
-Part load(Approx. 2000rpm) : 500~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

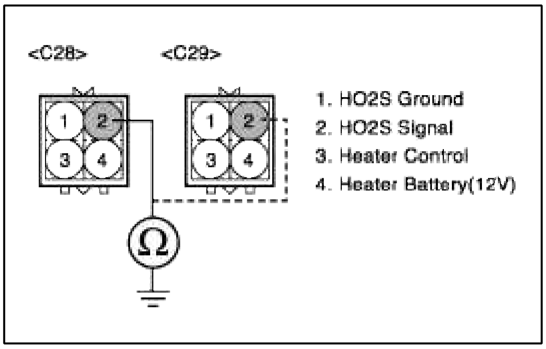
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for short to chassis ground in harness
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 2 of sensor harness connector and chassis ground.


<C28>
<C29>
1
2
3
4
Ω
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

   (5) Is measure resistance within Specification?

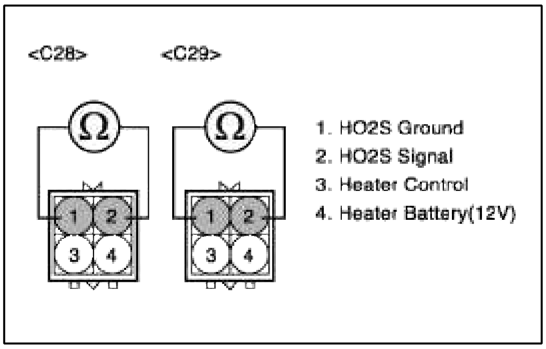
YES

Go to "Check for short to ground in harness " as below.

NO

Short circuit between HO2S signal circuit and chassis ground.
Short to chassis ground between PCM harness connector and HO2S harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 , 2 of sensor harness connector.


<C28>
<C29>
Ω
1
2
3
4
1. HO2S Ground
2. HO2S Signal
3. Heater Control
4. Heater Battery(12V)

(5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit between HO2S signal circuit and ground circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S

(1) Thoroughly check HO2S for contamination,deterioration or damage.

(2) Is HO2S contaminated,deteriorated or damaged?

YES

Substitute with a known-good HO2S and check for proper operation. If the problem is corrected, eplace HO2S and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check PCM" as below.

2. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of ECM.

(1) Ignition "OFF"

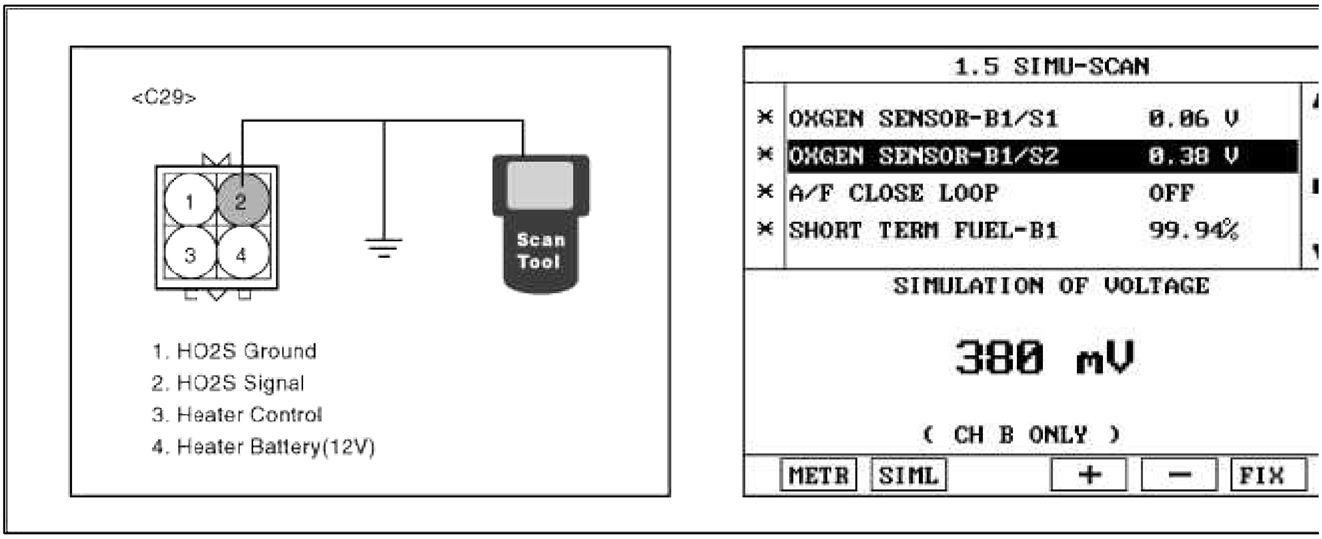
(2) Disconnect HO2S sensor connector.

(3) Connect Scantool and Engine "ON "

(4) Select simulation function on scantool.

(5) Simulate voltage at terminal 2 of HO2S sensor signal connector.

(6) Verify HO2S voltage to change while raising or lowering simulation voltage with scan tool within 0.2 ~ 0.8 V



* OXGEN SENSOR-B1/S1 0.06 V
* OXGEN SENSOR-B1/S2 0.38 V
* A/F CLOSE LOOP OFF
* SHORT TERM FUEL-B1 99.94%

SIMULATION OF VOLTAGE

380 mV

(CH B ONLY)

(7) Is HO2S signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> It is not permitted to check the inetrnal resistance of HO2S with analog multimeter.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

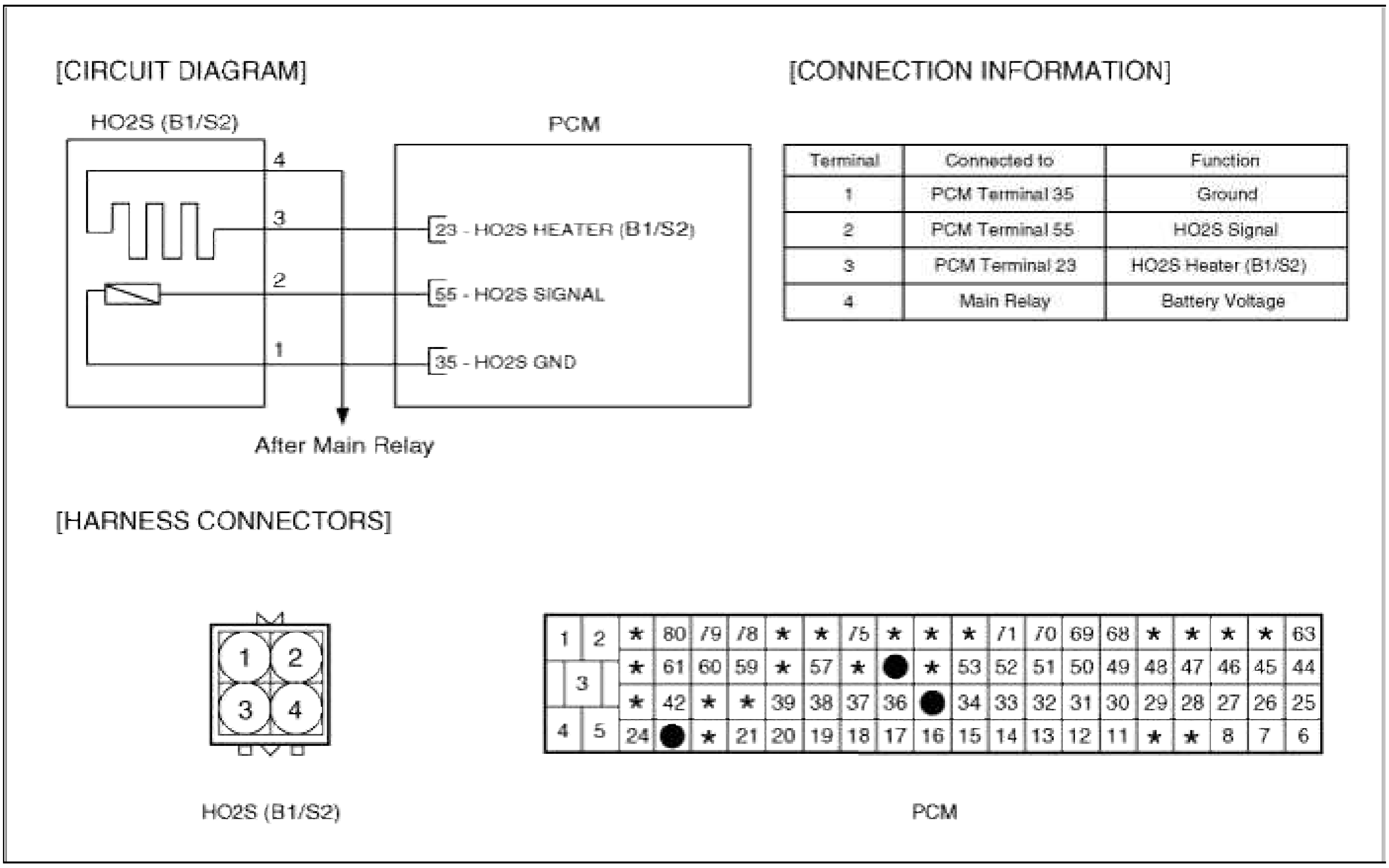
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM



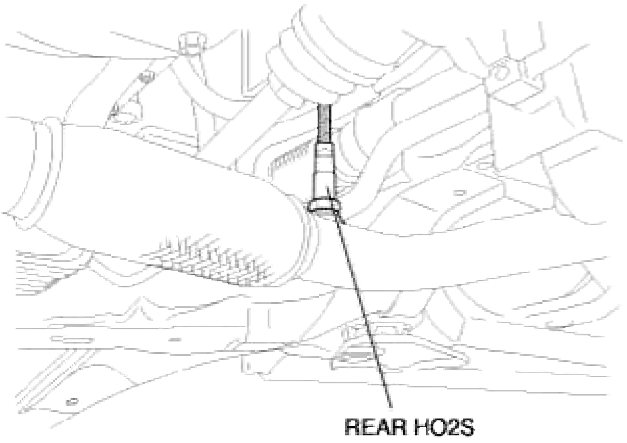
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 35	Ground
2	PCM Terminal 55	HO2S Signal
3	PCM Terminal 23	HO2S Heater (B1/S2)
4	Main Relay	Battery Voltage

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	●	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	●	34	33	32	31	30	29	28	27	26	25
4	5	24	●	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0138

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

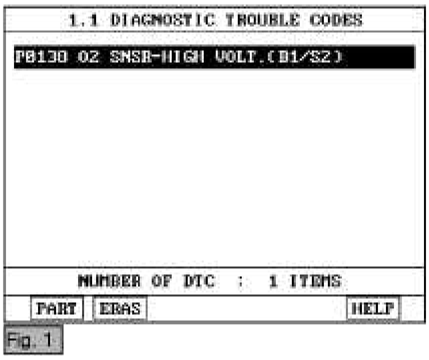
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check , High	● Short to battery in control circuit ● Faulty HO2S ● Faulty PCM
Threshold value	● Sensor voltage : > 1.08V	
Enable Conditions	● Short circuit	
Diagnostic Time	● 5 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

3. Monitor the "HO2S signal" parameter on the scantool.


```
1.1 DIAGNOSTIC TROUBLE CODES
P0130 O2 SNSR-HIGH VOLT.(B1/S2)

NUMBER OF DTC  :  1 ITEMS
```

Fig. 1

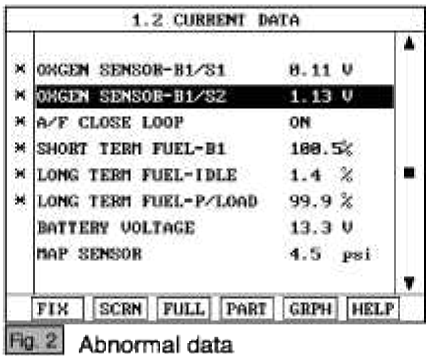

```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1        0.11 V
* OXGEN SENSOR-B1/S2        1.13 V
* A/F CLOSE LOOP            ON
* SHORT TERM FUEL-B1        100.5%
* LONG TERM FUEL-IDLE       1.4  %
* LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.3 V
  MAP SENSOR                4.5  psi
```

Fig. 2 Abnormal data

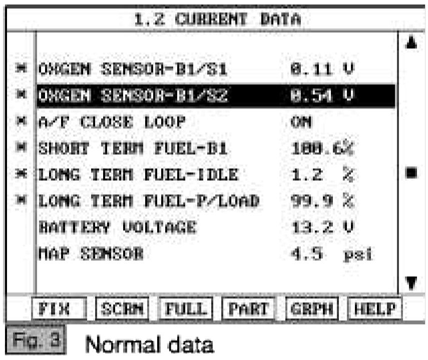

```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1        0.11 V
* OXGEN SENSOR-B1/S2        0.54 V
* A/F CLOSE LOOP            ON
* SHORT TERM FUEL-B1        100.6%
* LONG TERM FUEL-IDLE       1.2  %
* LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.2 V
  MAP SENSOR                4.5  psi
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
For front HO2S
-When decelerating suddeniy from 4000rpm : 200mV or less
-When engine is suddenly raced : 600~1000mV
-1500rpm : The fluctuation between 400mV or less and 600~1000mV
For Rear HO2S
-Part load(Approx. 2000rpm) : 500~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

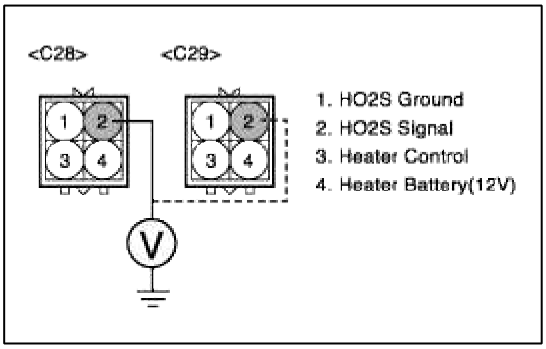
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for short to power in harness
   (1) Ignition "OFF"
   (2) Disconnect HO2S sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector.



   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit to battery between HO2S harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when HO2S harness connector disconnected,the output voltage at terminal 2 is 12V.
> Possible cause: Short circuit to battery in harness between E/R-J/BOX and terminal 2 of HO2S heater.

COMPONENT INSPECTION

1. Check HO2S
   (1) Thoroughly check HO2S for contamination,deterioration or damage.
   (2) Is HO2S contaminated,deteriorated or damaged?

YES

Substitute with a known-good HO2S and check for proper operation. If the problem is corrected, eplace HO2S and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check PCM" as below.

2. Check PCM

The purpose of checking PCM is to determine whether there is any malfunction of PCM.

(1) Ignition "OFF"

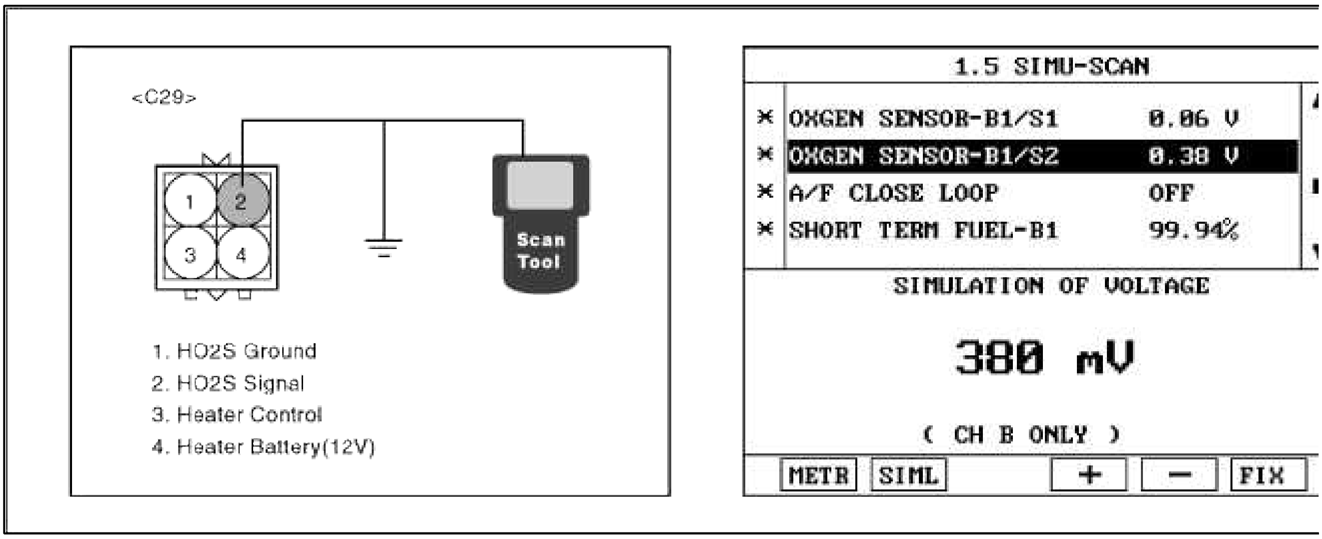
(2) Disconnect HO2S sensor connector.

(3) Connect Scantool and Engine "ON "

(4) Select simulation function on scantool.

(5) Simulate voltage at terminal 2 of HO2S sensor signal connector.

(6) Verify HO2S voltage to change while raising or lowering simulation voltage with scan tool within 0.2 ~ 0.8 V



```
1.5 SIMU-SCAN
* OXGEN SENSOR-B1/S1      0.06 V
* OXGEN SENSOR-B1/S2      0.38 V
* A/F CLOSE LOOP          OFF
* SHORT TERM FUEL-B1      99.94%
     SIMULATION OF VOLTAGE

           380 mV

        ( CH B ONLY )
METR SIML      +    -    FIX
```

(7) Is HO2S signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

NOTE

It is not permitted to check the inetrnal resistance of HO2S with analog multimeter.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

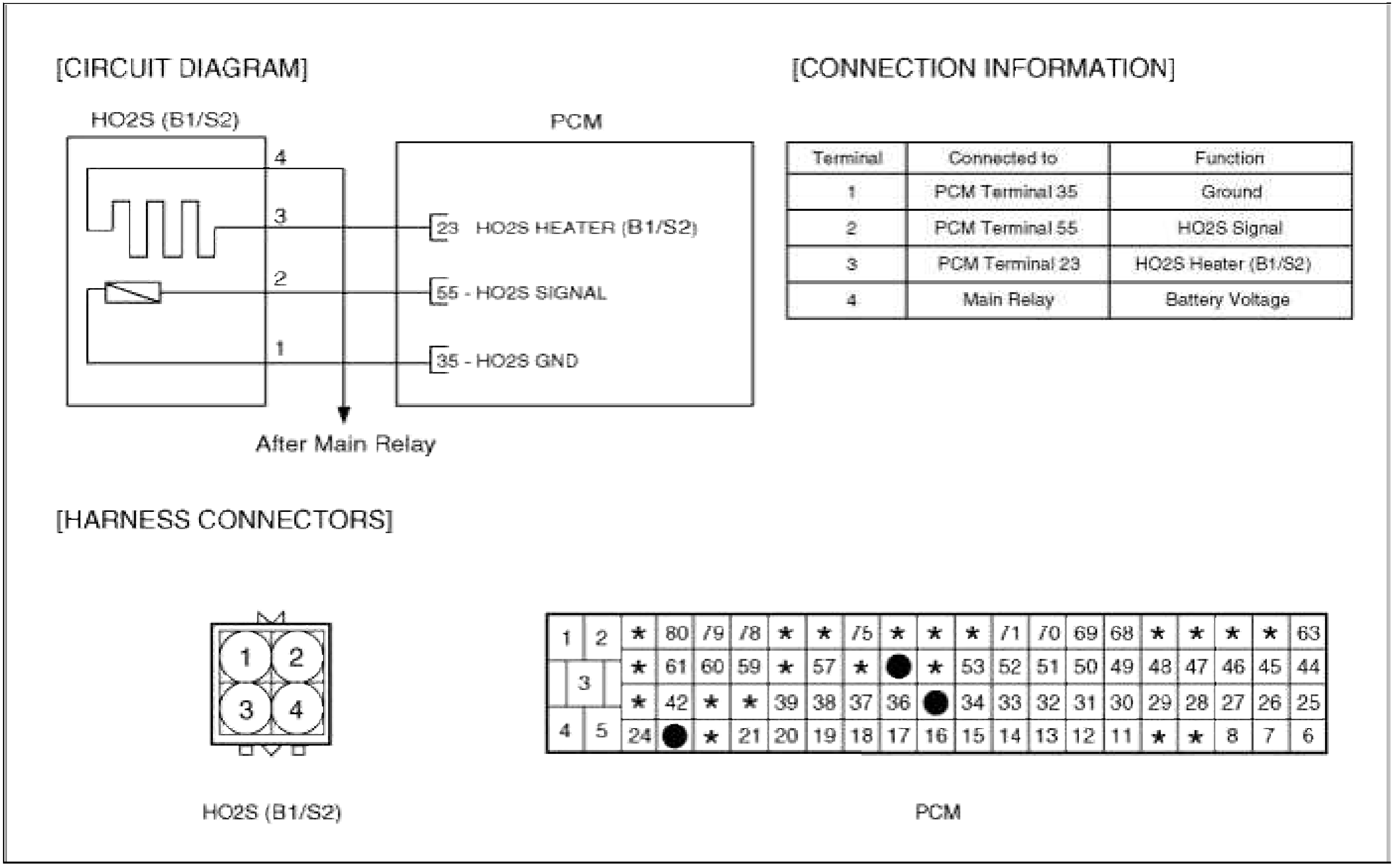
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

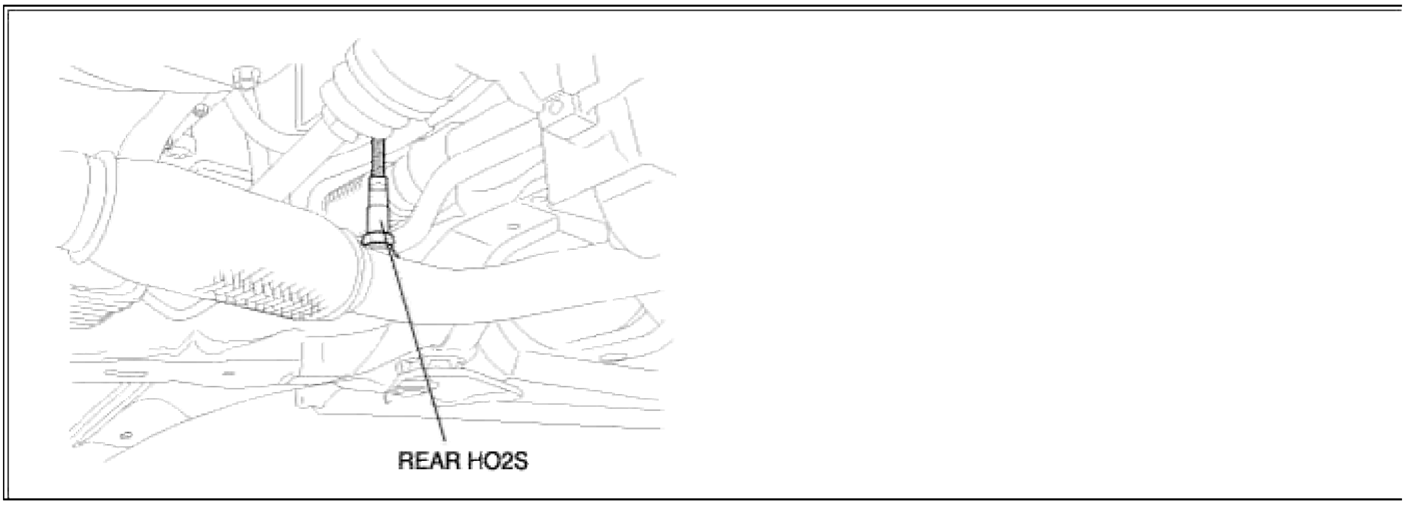
SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
HO2S (B1/S2)
PCM
4
3
2
1
23 HO2S HEATER (B1/S2)
55 - HO2S SIGNAL
35 - HO2S GND
After Main Relay
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
1 2 3 4
HO2S (B1/S2)
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ ● ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 ● 34 33 32 31 30 29 28 27 26 25
4 5 24 ● ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

Terminal	Connected to	Function
1	PCM Terminal 35	Ground
2	PCM Terminal 55	HO2S Signal
3	PCM Terminal 23	HO2S Heater (B1/S2)
4	Main Relay	Battery Voltage

Fuel System > Troubleshooting > P0140

COMPONENT LOCATION



GENERAL DESCTIPTION

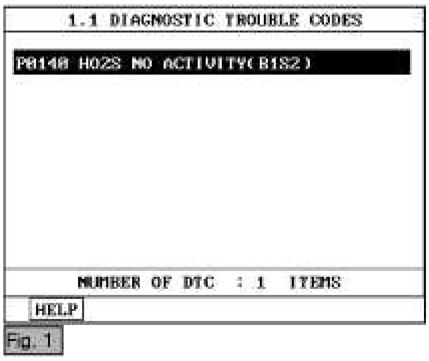
DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
Monitoring Strategy		● Signal check, wiring interruption	● Open in signal and ground circuit ● Faulty HO2S ● Faulty ECM ● Poor connections between HO2S and PCM ● Misplaced,bent,loose or corroded terminals.
Case1	Threshold value	● Sensor voltage : 0.4 ~ 0.52V	
	Enable Conditions	● Supply 0.45V	
	Diagnostic Time	● 600 sec	
Case2	Threshold value	● Internal resistance > 40 kΩ	
	Enable Conditions	● Catalyst temperature (model) > 600 degC(1112 °F)	
	Diagnostic Time		
Fail Safe		● None	

MONITOR DTC STATUS

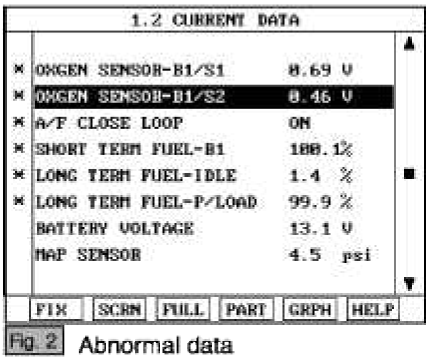
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "HO2S signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0140 HO2S NO ACTIVITY(B1S2)

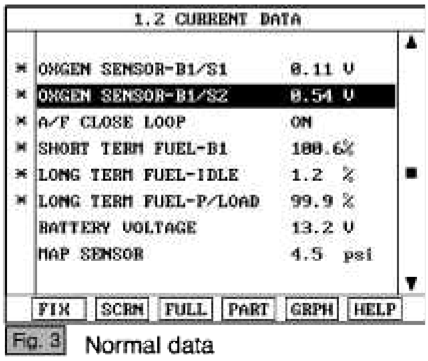
NUMBER OF DTC  : 1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1        0.69 V
* OXGEN SENSOR-B1/S2        0.46 V
* A/F CLOSE LOOP            ON
* SHORT TERM FUEL-B1        100.1%
* LONG TERM FUEL-IDLE       1.4  %
* LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.1 V
  MAP SENSOR                4.5  psi
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* OXGEN SENSOR-B1/S1        0.11 V
* OXGEN SENSOR-B1/S2        0.54 V
* A/F CLOSE LOOP            ON
* SHORT TERM FUEL-B1        100.6%
* LONG TERM FUEL-IDLE       1.2  %
* LONG TERM FUEL-P/LOAD     99.9 %
  BATTERY VOLTAGE           13.2 V
  MAP SENSOR                4.5  psi
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
For front HO2S
-When decelerating suddeniy from 4000rpm : 200mV or less
-When engine is suddenly raced : 600~1000mV
-1500rpm : The fluctuation between 400mV or less and 600~1000mV
For Rear HO2S
-Part load(Approx. 2000rpm) : 500~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

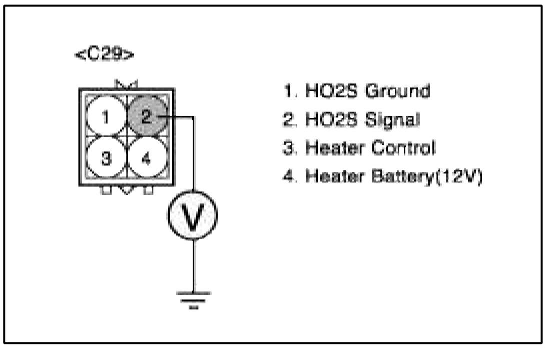
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness(signal)
   (1) Check for open in harness(signal)
   (2) Disconnect HO2S sensor connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector and and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Check for open in harness(ground) " as below.

NO

Open circuit between HO2S harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

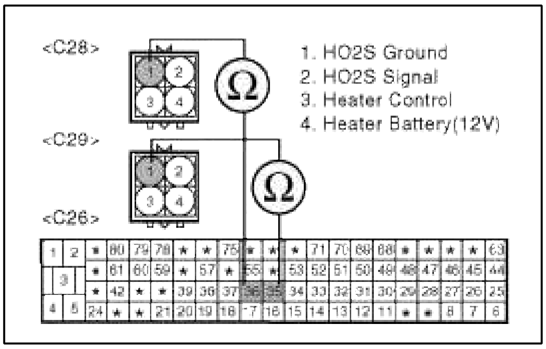
2. Check for open in harness(ground)

(1) Ignition "OFF"

(2) Disconnect HO2S sensor connector and PCM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure resistance between terminal 1 of sensor harness connector and PCM harness connector.



(5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between HO2S harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check HO2S

(1) Thoroughly check HO2S for contamination,deterioration or damage.

(2) Is HO2S contaminated,deteriorated or damaged?

YES

Substitute with a known-good HO2S and check for proper operation. If the problem is corrected, eplace HO2S and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "Check PCM" as below.

2. Check PCM

The purpose of checking PCM is to determine whether there is any malfunction of PCM.

(1) Ignition "OFF"

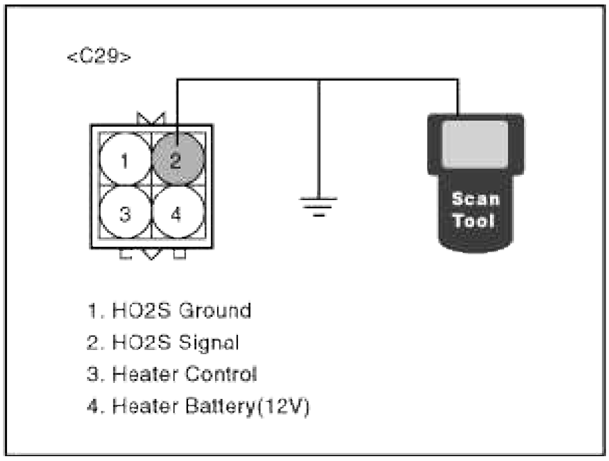
(2) Disconnect HO2S sensor connector.

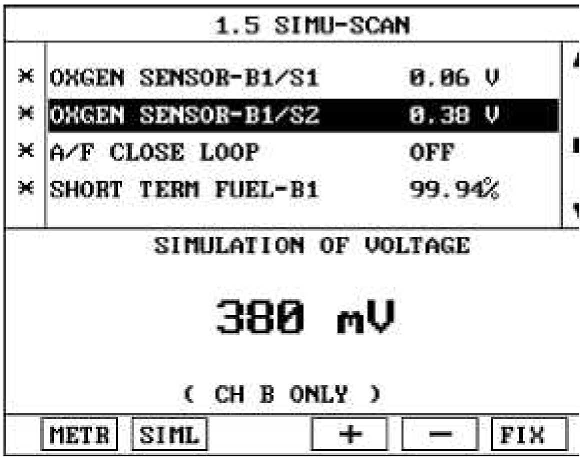
(3) Connect Scantool and Engine "ON "

(4) Select simulation function on scantool.

(5) Simulate voltage at terminal 2 of HO2S sensor signal connector.

(6) Verify HO2S voltage to change while raising or lowering simulation voltage with scan tool within 0.2 ~ 0.8 V





```
1.5 SIMU-SCAN
* OXGEN SENSOR-B1/S1       0.06 V
* OXGEN SENSOR-B1/S2       0.38 V
* A/F CLOSE LOOP           OFF
* SHORT TERM FUEL-B1       99.94%
SIMULATION OF VOLTAGE
380 mV
( CH B ONLY )
```

(7) Is HO2S signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination, deteriorat damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

NOTE

It is not permitted to check the inetrnal resistance of HO2S with analog multimeter.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

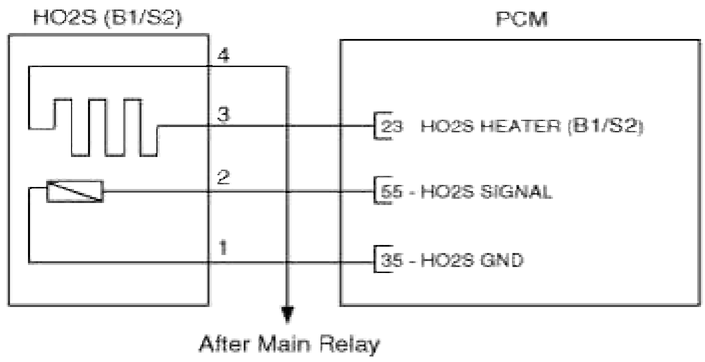
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

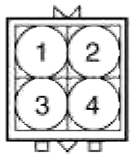
[CIRCUIT DIAGRAM]


HO2S (B1/S2)
PCM
4
3
2
1
23 HO2S HEATER (B1/S2)
55 - HO2S SIGNAL
35 - HO2S GND
After Main Relay

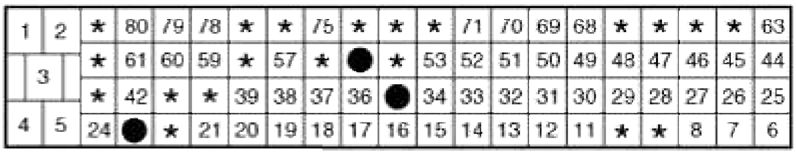
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM Terminal 35	Ground
2	PCM Terminal 55	HO2S Signal
3	PCM Terminal 23	HO2S Heater (B1/S2)
4	Main Relay	Battery Voltage

[HARNESS CONNECTORS]



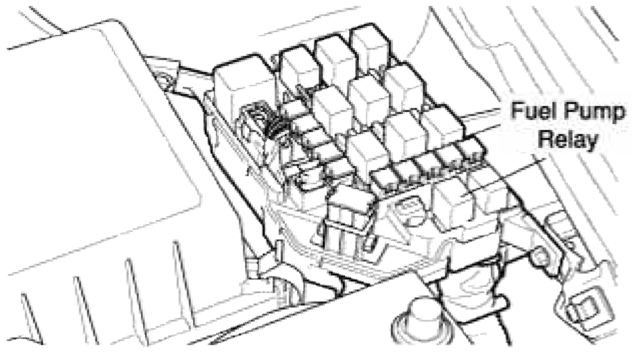
HO2S (B1/S2)


1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ ● ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 ● 34 33 32 31 30 29 28 27 26 25
4 5 24 ● ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6

PCM

Fuel System > Troubleshooting > P0230

COMPONENT LOCATION


Fuel Pump Relay

GENERAL DESCTIPTION

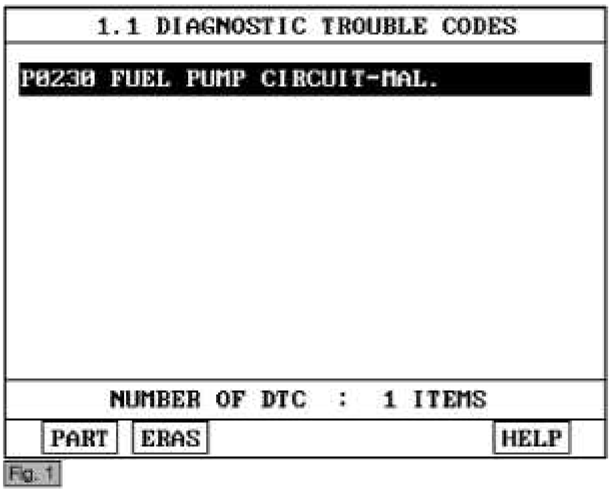
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Circuit continuity check	● Short to ground in control circuit (pin 70 to chassis ground) ● Open in control circuit (pin 70) ● Faulty fuel pump relay ● Faulty PCM
Threshold value	● Shorted or disconnected	
Enable Conditions	● Not monitor	
Diagnostic Time		
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "Fuel pump relay" parameter on the scantool.

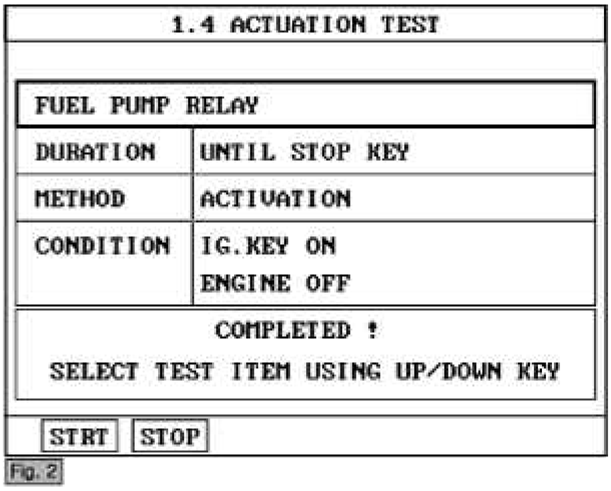


1.1 DIAGNOSTIC TROUBLE CODES

P0230 FUEL PUMP CIRCUIT-MAL.

NUMBER OF DTC : 1 ITEMS

Fig. 1



1.4 ACTUATION TEST

FUEL PUMP RELAY	
DURATION	UNTIL STOP KEY
METHOD	ACTIVATION
CONDITION	IG.KEY ON ENGINE OFF

COMPLETED !

SELECT TEST ITEM USING UP/DOWN KEY

Fig. 2

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
Ignition switch ON : ON 1.5 sec →OFF
Engine running : ON

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

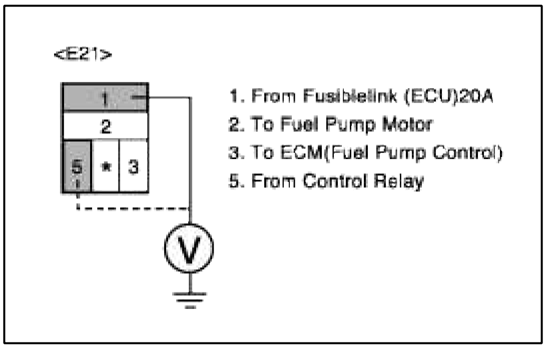
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect connect fuel pump relay.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 and 5 of fuel pump relay harness connector and chassis ground.


<E21>
1
2
5
★
3
1. From Fusiblelink (ECU)20A
2. To Fuel Pump Motor
3. To ECM(Fuel Pump Control)
5. From Control Relay
V

5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

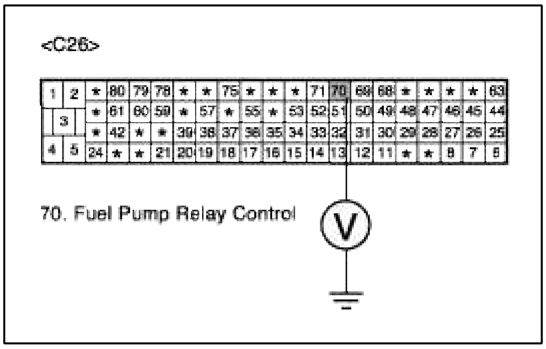
NO

Open circuit or short circuit to chassis ground between fuel pump relay and control relay.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Connect fuel pump relay and PCM connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 70 of ECM harness connector and chassis ground.


<C26>
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
70. Fuel Pump Relay Control
V

5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

Short circuit to chassis ground between fuel pump relay signal circuit and PCM harness connector.

Open circuit between fuel pump relay signal circuit and PCM harness connector.

Open circuit pump relay.

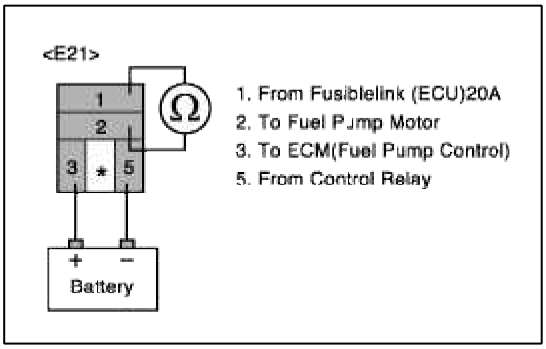
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

1. In case the voltage at terminal 70 of PCM is 0V.
   Possible cause: Open circuit between fuel pump relay and ECM, or open coil in fuel pump relay

COMPONENT INSPECTION

1. Check fuel pump relay
   (1) Ignition "OFF"
   (2) Disconnect the fuel pump relay
   (3) Apply 12V and a ground to 3 and 5 terminals of the fuel pump relay
   (4) Measure resistance between terminal 1 and 2 of fuel pump relay connector(To sensor side)



   (5) Does each resistance indicate continuity circuit?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good control relay and check for proper operation. If the problem is corrected, replace control relay and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

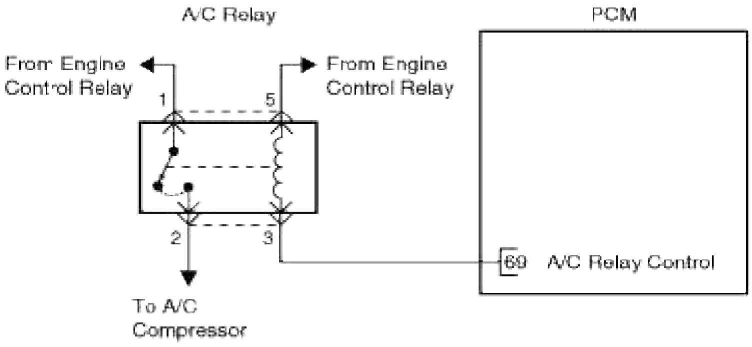
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

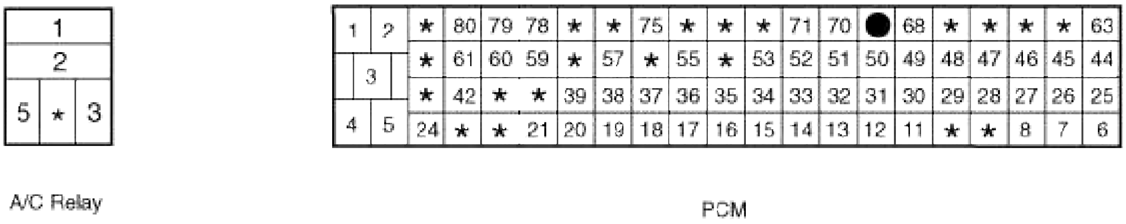
[CIRCUIT DIAGRAM]


A/C Relay
From Engine Control Relay
From Engine Control Relay
1
5
2
3
To A/C Compressor
PCM
69
A/C Relay Control

[CONNECTION INFORMATION]

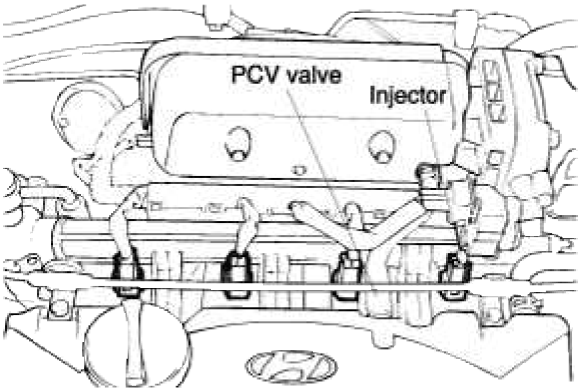
Terminal	Connected to	Function
1	Battery	Battery Voltage
2	A/C Compressor	Battery Voltage
3	PCM Terminal 69	A/C Relay Control
5	Battery	Battery Voltage

[HARNESS CONNECTORS]


1
2
5 ★ 3
A/C Relay
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 ● 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P0261

COMPONENT LOCATION


PCV valve
Injector

GENERAL DESCTIPTION

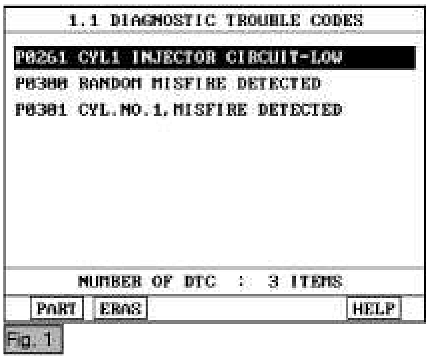
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, low	● Open in battery circuit ● Open in control circuit ● Short to ground in control circuit ● Faulty injector's ● Faulty PCM
Threshold value	● Shorted or disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe	● None	

MONITOR DTC STATUS

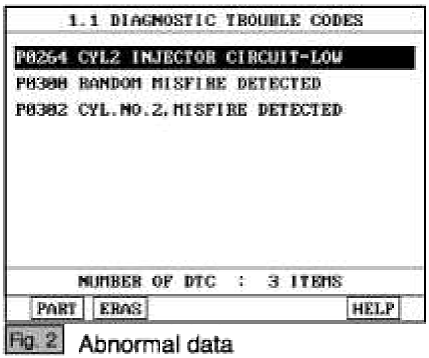
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "INJ duration" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0261 CYL1 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0301 CYL.NO.1.MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

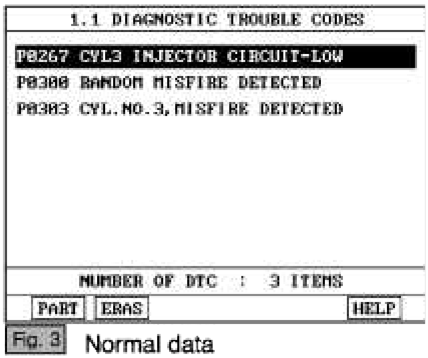
Fig. 1



```
1.1 DIAGNOSTIC TROUBLE CODES
P0264 CYL2 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0302 CYL.NO.2.MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

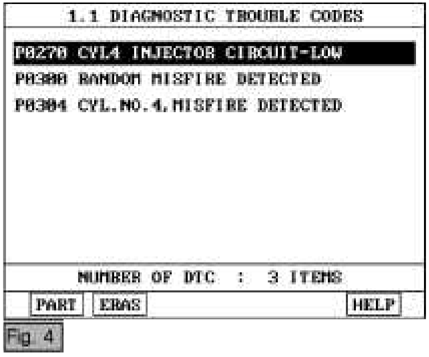
Fig. 2 Abnormal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0267 CYL3 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0303 CYL.NO.3.MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

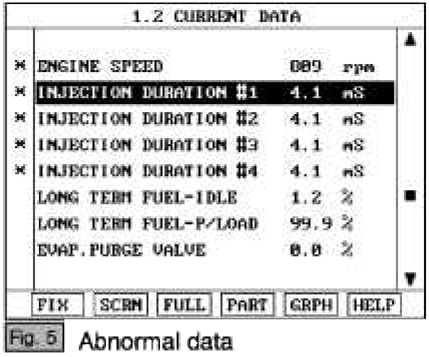
Fig. 3 Normal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0270 CYL4 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0304 CYL.NO.4.MISFIRE DETECTED

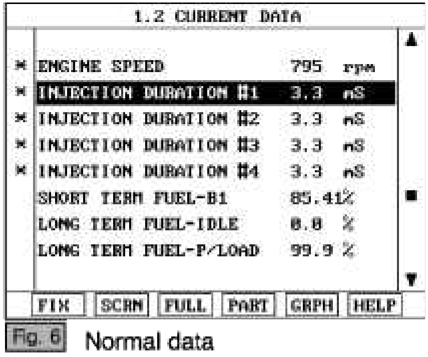
NUMBER OF DTC  :  3 ITEMS
```

Fig. 4



```
1.2 CURRENT DATA
* ENGINE SPEED              089  rpm
* INJECTION DURATION #1     4.1  mS
* INJECTION DURATION #2     4.1  mS
* INJECTION DURATION #3     4.1  mS
* INJECTION DURATION #4     4.1  mS
  LONG TERM FUEL-IDLE       1.2  %
  LONG TERM FUEL-P/LOAD     99.9 %
  EVAP.PURGE VALVE          0.0  %
```

Fig. 5 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED              795  rpm
* INJECTION DURATION #1     3.3  mS
* INJECTION DURATION #2     3.3  mS
* INJECTION DURATION #3     3.3  mS
* INJECTION DURATION #4     3.3  mS
  SHORT TERM FUEL-B1        85.41%
  LONG TERM FUEL-IDLE       0.0  %
  LONG TERM FUEL-P/LOAD     99.9 %
```

Fig. 6 Normal data

NOTE

The Injector operating time should be checked in P or N range, warmed-up and idling condition.
The data shown above is only for reference and there may be a little difference actually.

Service standard
In idling: 2.2 ~ 5.0ms
2500 rpm : 2.0 ~ 5.0ms

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

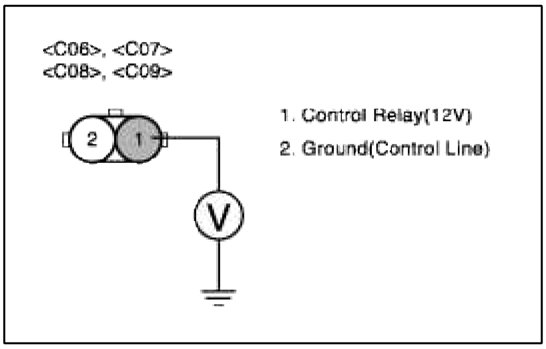
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect INJ connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

Open circuit or short circuit to chassis ground between INJ harness connector and control relay.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

NOTE

1.In case the voltage between terminal 1 of injector and terminal 27,6,7 and 47 of PCM is 1V respectively.

Suspect area : Open or short circuit of power line from injector to PCM.

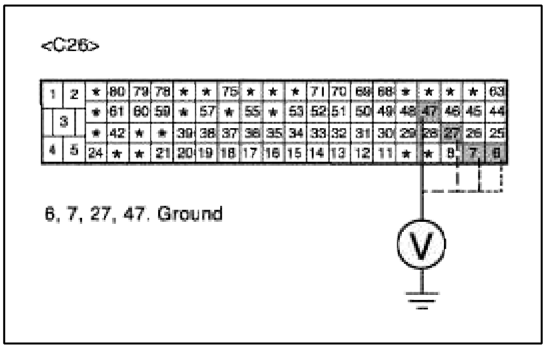
CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"

   (2) Connect INJ connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 27 of ECM harness connector and chassis ground..


<C26>
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
6, 7, 27, 47. Ground
V

   (5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

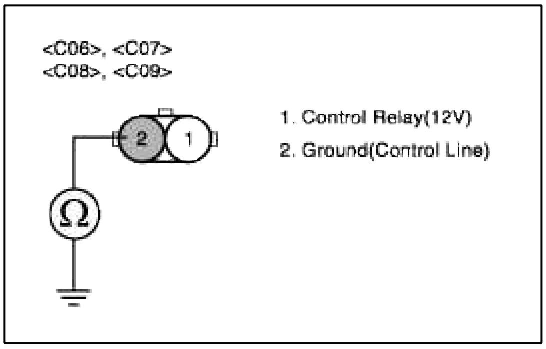
Open or Short circuit to chassis ground between INJ harness connector and PCM harness connector.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for short to ground in harness
   (1) Ignition "OFF"

   (2) Disconnect INJ connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure resistance between terminal 2 of sensor harness connector and chassis ground..


<C06>, <C07>
<C08>, <C09>
2
1
Ω
1. Control Relay(12V)
2. Ground(Control Line)

   (5) Is measure resistance within Specification?

YES

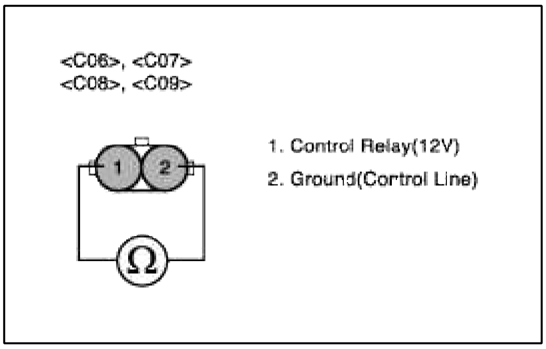
Go to "Component Inspection" procedure.

NO

Short circuit between injector control circuit and chassis ground.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check INJ
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good INJ and check for proper operation. If the problem is corrected, replace INJ and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

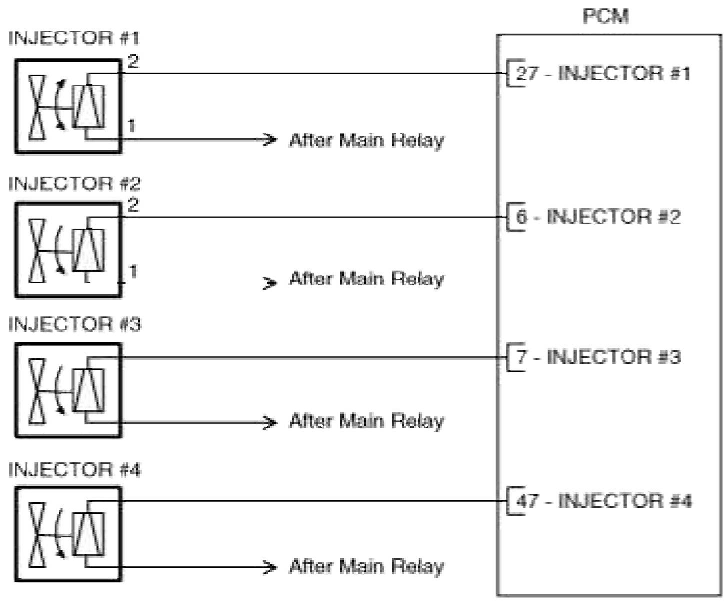
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

[CIRCUIT DIAGRAM]


PCM
INJECTOR #1
2
1
After Main Relay
27 - INJECTOR #1
INJECTOR #2
2
1
After Main Relay
6 - INJECTOR #2
INJECTOR #3
After Main Relay
7 - INJECTOR #3
INJECTOR #4
After Main Relay
47 - INJECTOR #4

[CONNECTION INFORMATION]

INJECTOR #1

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 27	Injector Control

INJECTOR #2

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 6	Injector Control

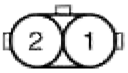
INJECTOR #3

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 7	Injector Control

INJECTOR #4

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 47	Injector Control

[HARNESS CONNECTORS]



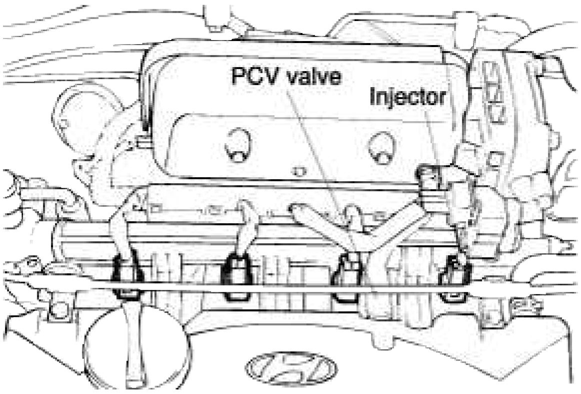
INJECTOR #1, #2, #3, #4

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	●	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	●	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	●	●

PCM

Fuel System > Troubleshooting > P0262

COMPONENT LOCATION


PCV valve
Injector

GENERAL DESCTIPTION

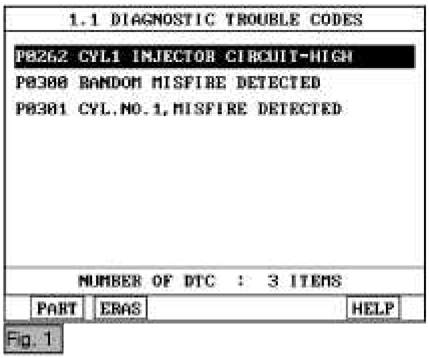
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, High	● Short to battery in control circuit ● Faulty injector's ● Faulty PCM
Threshold value	● Shorted or disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe	● None	

MONITOR DTC STATUS

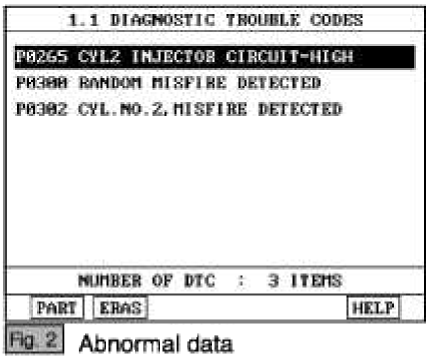
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "INJ duration" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0262 CYL1 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0301 CYL.NO.1,MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

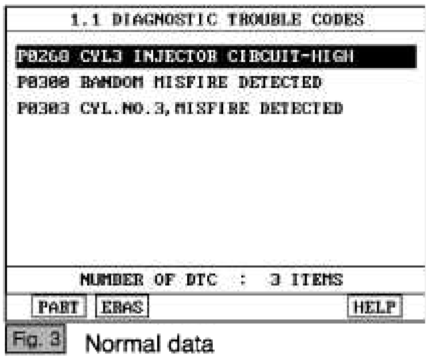
Fig. 1



```
1.1 DIAGNOSTIC TROUBLE CODES
P0265 CYL2 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0302 CYL.NO.2,MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

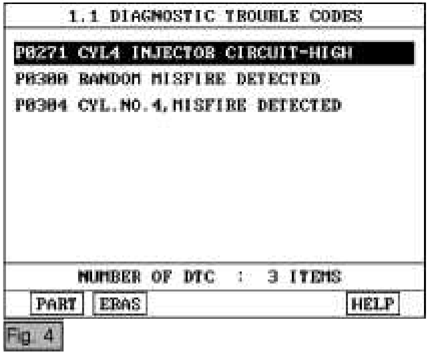
Fig. 2 Abnormal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0268 CYL3 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0303 CYL.NO.3,MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

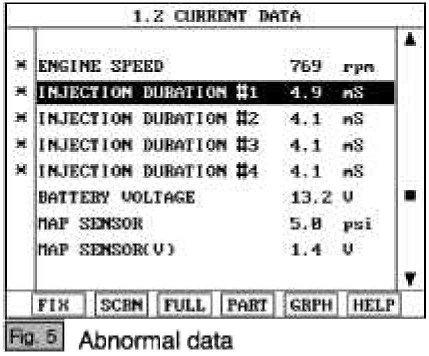
Fig. 3 Normal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0271 CYL4 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0304 CYL.NO.4,MISFIRE DETECTED

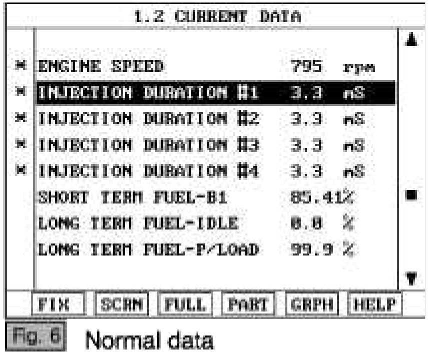
NUMBER OF DTC  :  3 ITEMS
```

Fig. 4



```
1.2 CURRENT DATA
* ENGINE SPEED              769  rpm
* INJECTION DURATION #1     4.9  mS
* INJECTION DURATION #2     4.1  mS
* INJECTION DURATION #3     4.1  mS
* INJECTION DURATION #4     4.1  mS
  BATTERY VOLTAGE           13.2 V
  MAP SENSOR                5.8  psi
  MAP SENSOR(V)             1.4  V
```

Fig. 5 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED              795  rpm
* INJECTION DURATION #1     3.3  mS
* INJECTION DURATION #2     3.3  mS
* INJECTION DURATION #3     3.3  mS
* INJECTION DURATION #4     3.3  mS
  SHORT TERM FUEL-B1        85.41%
  LONG TERM FUEL-IDLE       0.0  %
  LONG TERM FUEL-P/LOAD     99.9 %
```

Fig. 6 Normal data

NOTE

The Injector operating time should be checked in P or N range, warmed-up and idling condition.
The data shown above is only for reference and there may be a little difference actually.

Service standard
In idling: 2.2 ~ 5.0ms
2500 rpm : 2.0 ~ 5.0ms

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

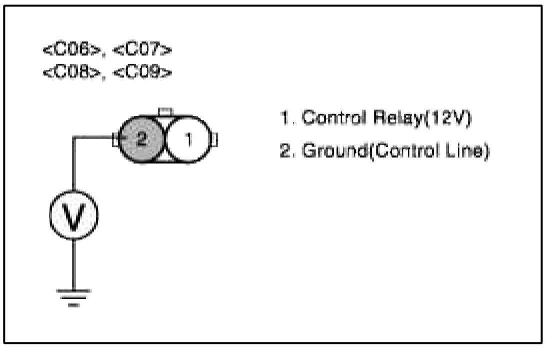
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

CONTROL CIRCUIT INSPECTION

1. Check for short to power in harness
   - (1) Ignition "OFF"
   - (2) Disconnect INJ connector.
   - (3) Ignition "ON" & Engine "OFF"
   - (4) Measure voltage between terminal 2 of sensor harness connector and chassis ground..



(5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

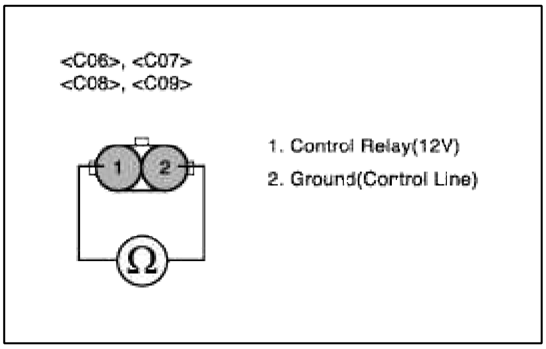
Short circuit to battery power 12V between injector harness connector and control relay.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

> **NOTE**
>
> 1.In case the voltage of terminal 2 is measured 12V when the connector is disconnected.
>
> Suspect area: Short to battery power line after fuse(15A for injector) when IG on.

COMPONENT INSPECTION

1. Check INJ
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good INJ and check for proper operation. If the problem is corrected, replace INJ and then go to "Verification of Vehicle Repair" procedure.

NOTE

The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

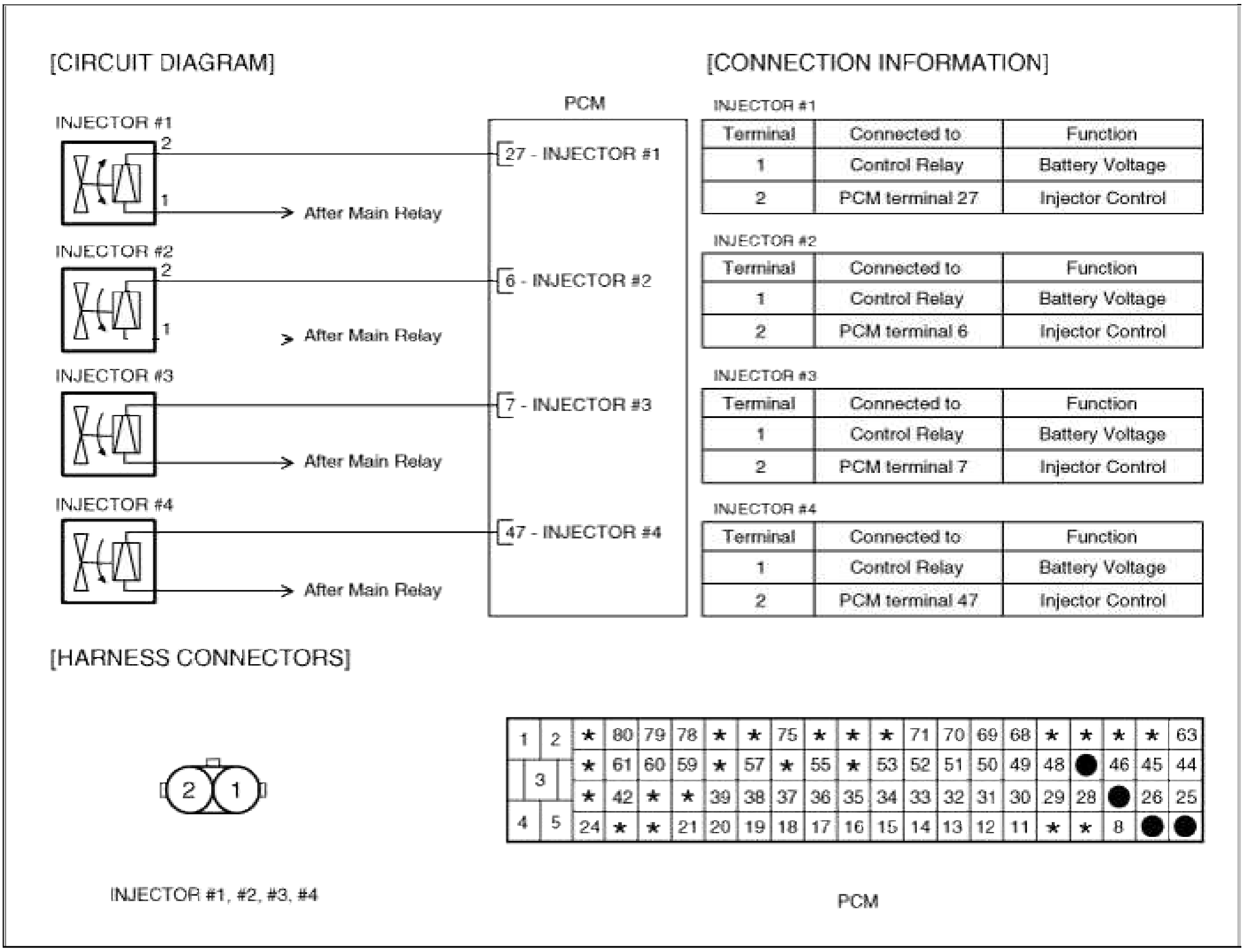
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
INJECTOR #1
2
1
After Main Relay
INJECTOR #2
2
1
After Main Relay
INJECTOR #3
After Main Relay
INJECTOR #4
After Main Relay
PCM
27 - INJECTOR #1
6 - INJECTOR #2
7 - INJECTOR #3
47 - INJECTOR #4
[HARNESS CONNECTORS]
2
1
INJECTOR #1, #2, #3, #4
PCM

[CONNECTION INFORMATION]

INJECTOR #1

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 27	Injector Control

INJECTOR #2

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 6	Injector Control

INJECTOR #3

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 7	Injector Control

INJECTOR #4

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 47	Injector Control

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	●	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	●	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	●	●

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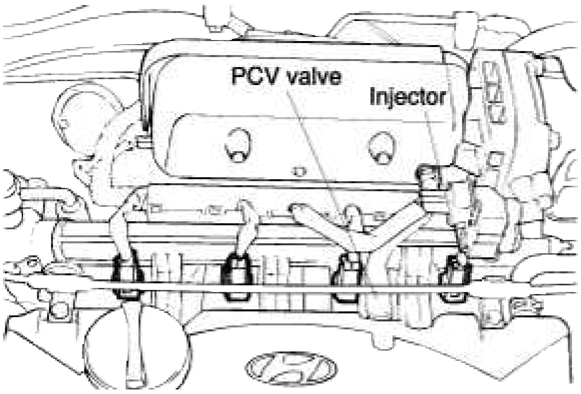
COMPONENT LOCATION


PCV valve
Injector

GENERAL DESCTIPTION

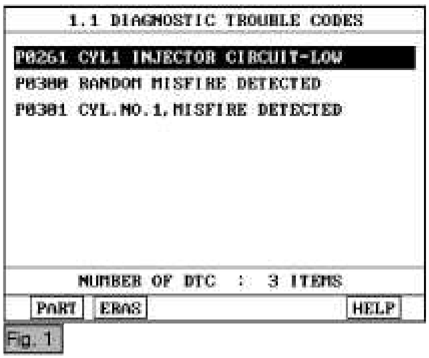
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, low	● Open in battery circuit ● Open in control circuit ● Short to ground in control circuit ● Faulty injector's ● Faulty PCM
Threshold value	● Shorted or disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe	● None	

MONITOR DTC STATUS

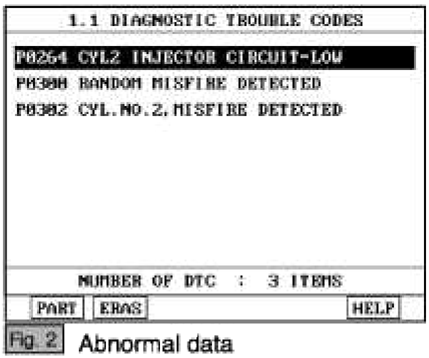
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "INJ duration" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0261 CYL1 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0301 CYL.NO.1.MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

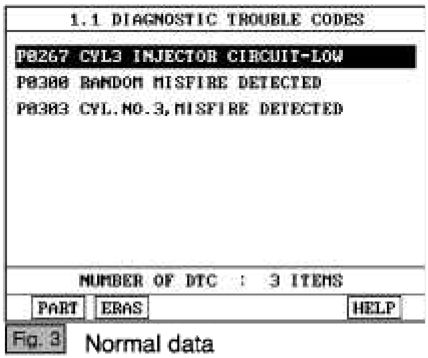
Fig. 1



```
1.1 DIAGNOSTIC TROUBLE CODES
P0264 CYL2 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0302 CYL.NO.2.MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

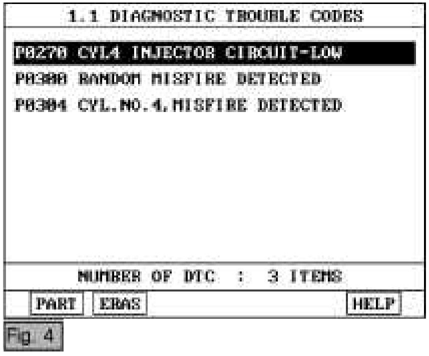
Fig. 2 Abnormal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0267 CYL3 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0303 CYL.NO.3.MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

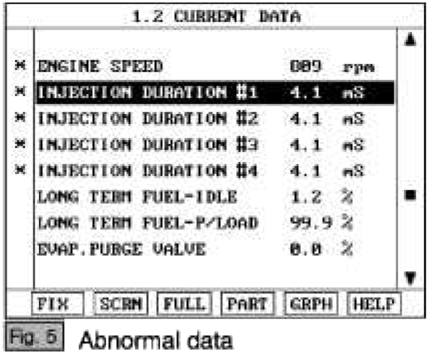
Fig. 3 Normal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0270 CYL4 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0304 CYL.NO.4.MISFIRE DETECTED

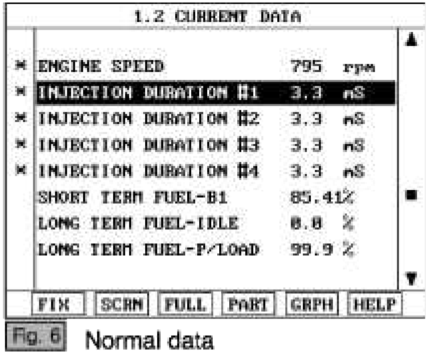
NUMBER OF DTC  :  3 ITEMS
```

Fig. 4



```
1.2 CURRENT DATA
* ENGINE SPEED              089  rpm
* INJECTION DURATION #1     4.1  mS
* INJECTION DURATION #2     4.1  mS
* INJECTION DURATION #3     4.1  mS
* INJECTION DURATION #4     4.1  mS
  LONG TERM FUEL-IDLE       1.2  %
  LONG TERM FUEL-P/LOAD     99.9 %
  EVAP.PURGE VALVE          0.0  %
```

Fig. 5 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED              795  rpm
* INJECTION DURATION #1     3.3  mS
* INJECTION DURATION #2     3.3  mS
* INJECTION DURATION #3     3.3  mS
* INJECTION DURATION #4     3.3  mS
  SHORT TERM FUEL-B1        85.41%
  LONG TERM FUEL-IDLE       0.0  %
  LONG TERM FUEL-P/LOAD     99.9 %
```

Fig. 6 Normal data

NOTE

The Injector operating time should be checked in P or N range, warmed-up and idling condition.
The data shown above is only for reference and there may be a little difference actually.

Service standard
In idling: 2.2 ~ 5.0ms
2500 rpm : 2.0 ~ 5.0ms

4. Is parameter displayed within specifications?

YES

ault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

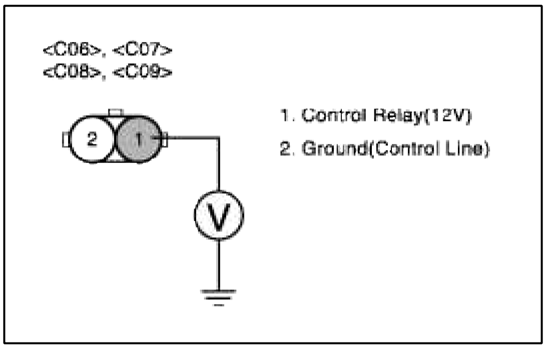
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect INJ connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

Open circuit or short circuit to chassis ground between INJ harness connector and control relay.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

> **NOTE**
>
> 1.In case the voltage between terminal 1 of injector and terminal 27,6,7 and 47 of PCM is 1V respectively.
>
> Suspect area : Open or short circuit of power line from injector to PCM.

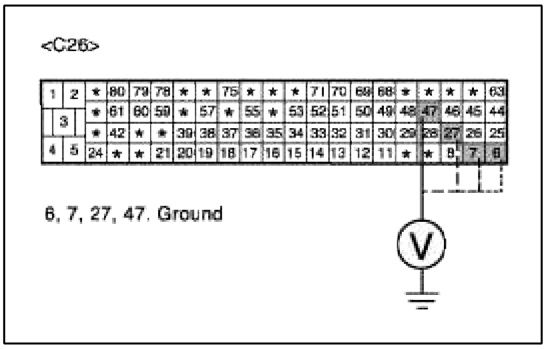
CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"

   (2) Connect INJ connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 27 of ECM harness connector and chassis ground..



   (5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

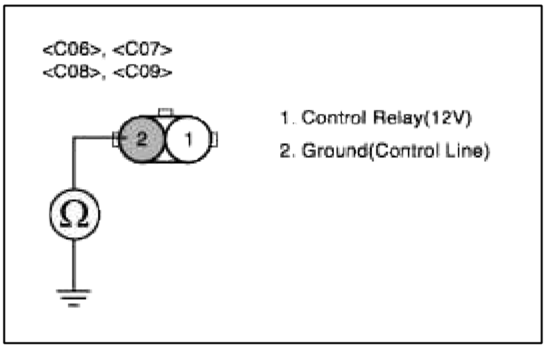
Open or Short circuit to chassis ground between INJ harness connector and PCM harness connector.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for short to ground in harness
   (1) Ignition "OFF"

   (2) Disconnect INJ connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure resistance between terminal 2 of sensor harness connector and chassis ground.



   (5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

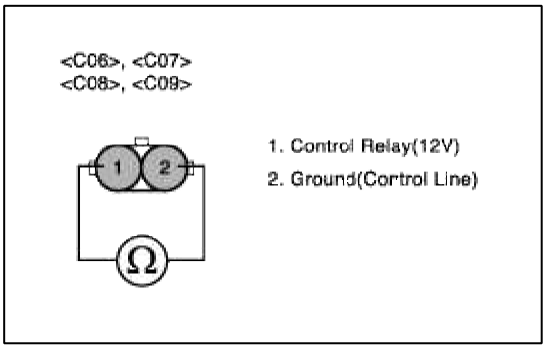
NO

Short circuit between injector control circuit and chassis ground.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check INJ

   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good INJ and check for proper operation. If the problem is corrected, replace INJ and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

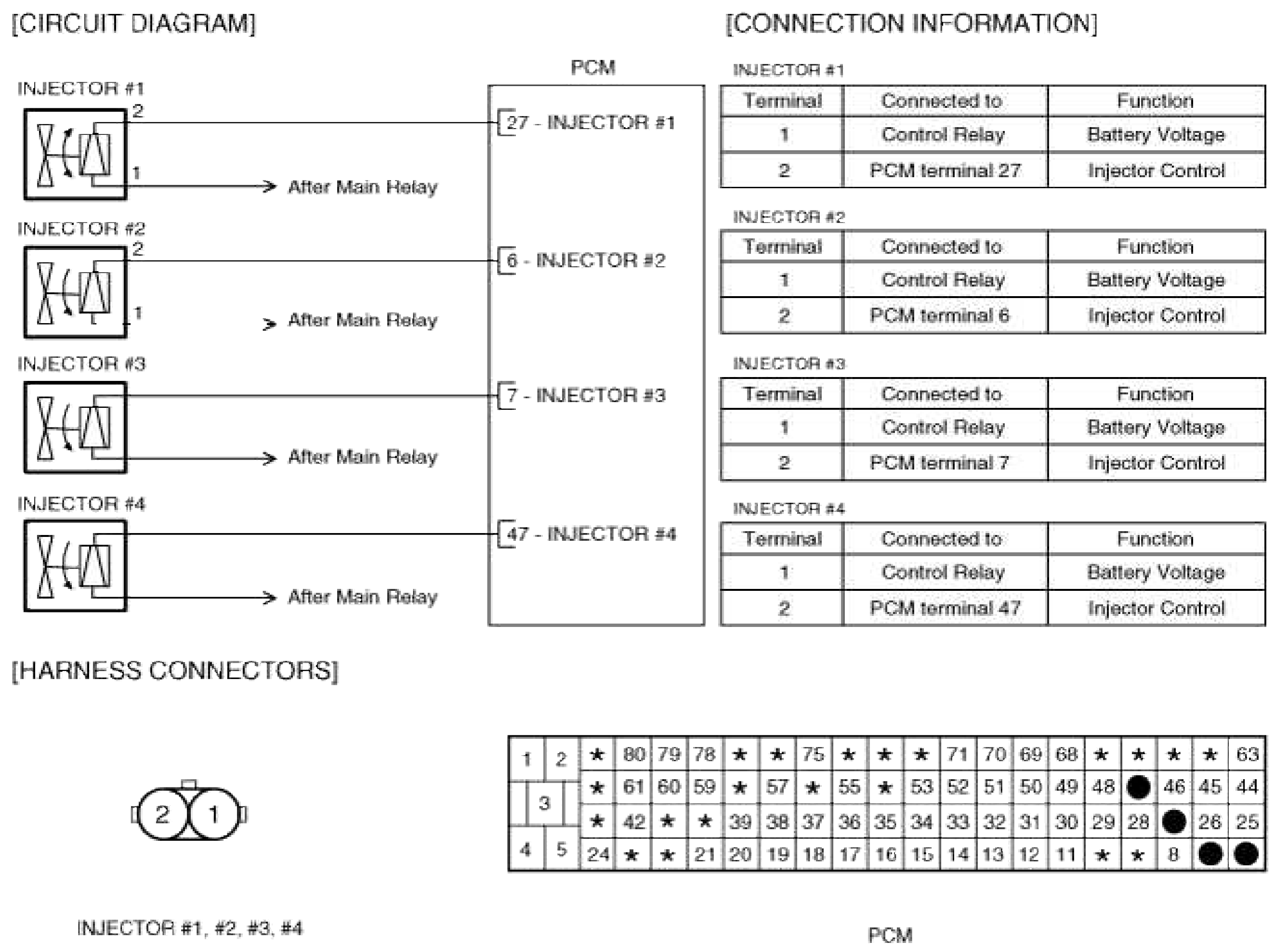
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
INJECTOR #1
INJECTOR #2
INJECTOR #3
INJECTOR #4
2
1
After Main Relay
PCM
27 - INJECTOR #1
6 - INJECTOR #2
7 - INJECTOR #3
47 - INJECTOR #4
[HARNESS CONNECTORS]
2 1
INJECTOR #1, #2, #3, #4
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 ● 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 ● 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 ● ●
PCM

[CONNECTION INFORMATION]

INJECTOR #1

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 27	Injector Control

INJECTOR #2

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 6	Injector Control

INJECTOR #3

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 7	Injector Control

INJECTOR #4

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 47	Injector Control

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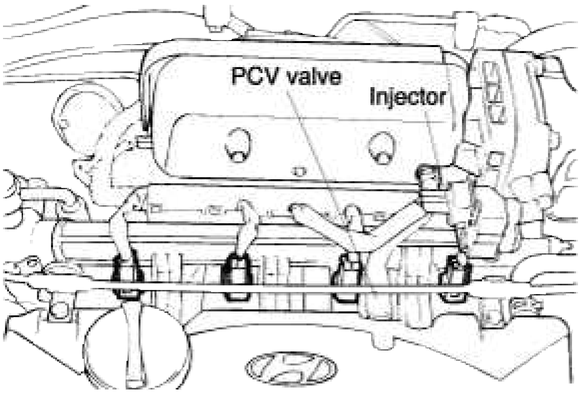
COMPONENT LOCATION


PCV valve
Injector

GENERAL DESCTIPTION

DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, High	● Short to battery in control circuit ● Faulty injector's ● Faulty PCM
Threshold value	● Shorted or disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "INJ duration" parameter on the scantool.

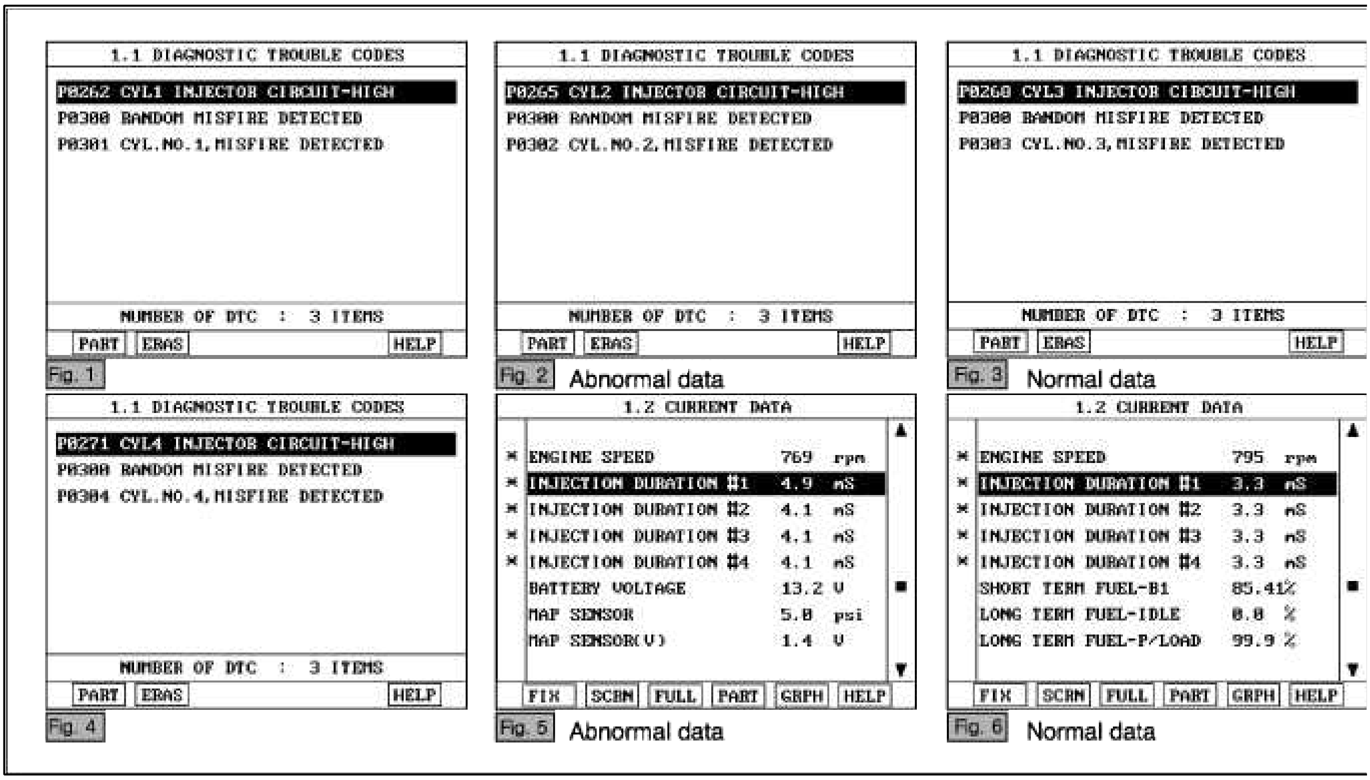


Fig. 1

```
1.1 DIAGNOSTIC TROUBLE CODES
P0262 CYL1 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0301 CYL.NO.1,MISFIRE DETECTED
NUMBER OF DTC  :  3 ITEMS
```

Fig. 2 Abnormal data

```
1.1 DIAGNOSTIC TROUBLE CODES
P0265 CYL2 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0302 CYL.NO.2,MISFIRE DETECTED
NUMBER OF DTC  :  3 ITEMS
```

Fig. 3 Normal data

```
1.1 DIAGNOSTIC TROUBLE CODES
P0268 CYL3 INJECTOR CIBCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0303 CYL.NO.3,MISFIRE DETECTED
NUMBER OF DTC  :  3 ITEMS
```

Fig. 4

```
1.1 DIAGNOSTIC TROUBLE CODES
P0271 CYL4 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0304 CYL.NO.4,MISFIRE DETECTED
NUMBER OF DTC  :  3 ITEMS
```

Fig. 5 Abnormal data

```
1.2 CURRENT DATA
* ENGINE SPEED            769   rpm
* INJECTION DURATION #1   4.9   mS
* INJECTION DURATION #2   4.1   mS
* INJECTION DURATION #3   4.1   mS
* INJECTION DURATION #4   4.1   mS
  BATTERY VOLTAGE         13.2  V
  MAP SENSOR              5.8   psi
  MAP SENSOR(V)           1.4   V
```

Fig. 6 Normal data

```
1.2 CURRENT DATA
* ENGINE SPEED            795   rpm
* INJECTION DURATION #1   3.3   mS
* INJECTION DURATION #2   3.3   mS
* INJECTION DURATION #3   3.3   mS
* INJECTION DURATION #4   3.3   mS
  SHORT TERM FUEL-B1      85.41%
  LONG TERM FUEL-IDLE     0.0   %
  LONG TERM FUEL-P/LOAD   99.9  %
```

NOTE

The Injector operating time should be checked in P or N range, warmed-up and idling condition.
The data shown above is only for reference and there may be a little difference actually.

Service standard
In idling: 2.2 ~ 5.0ms
2500 rpm : 2.0 ~ 5.0ms

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

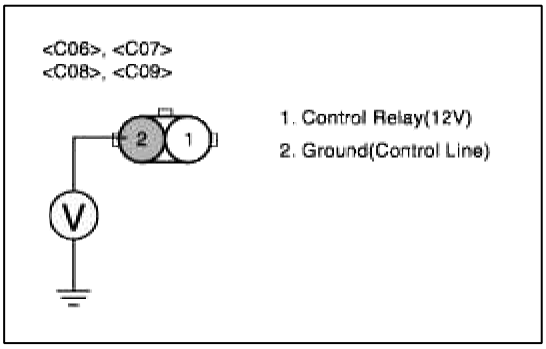
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

CONTROL CIRCUIT INSPECTION

1. Check for short to power in harness
   (1) Ignition "OFF"
   (2) Disconnect INJ connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector and chassis ground..



   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit to battery power 12V between injector harness connector and control relay.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

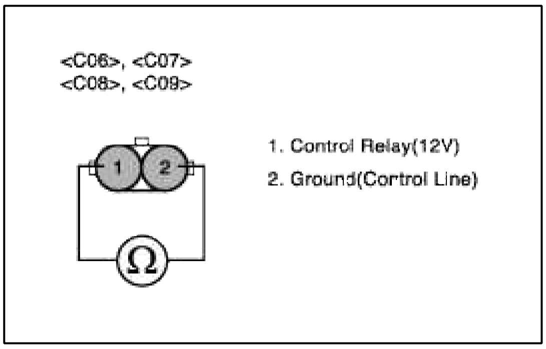
NOTE

1.In case the voltage of terminal 2 is measured 12V when the connector is disconnected.

Suspect area: Short to battery power line after fuse(15A for injector) when IG on.

COMPONENT INSPECTION

1. Check INJ
    (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



    (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good INJ and check for proper operation. If the problem is corrected, replace INJ and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

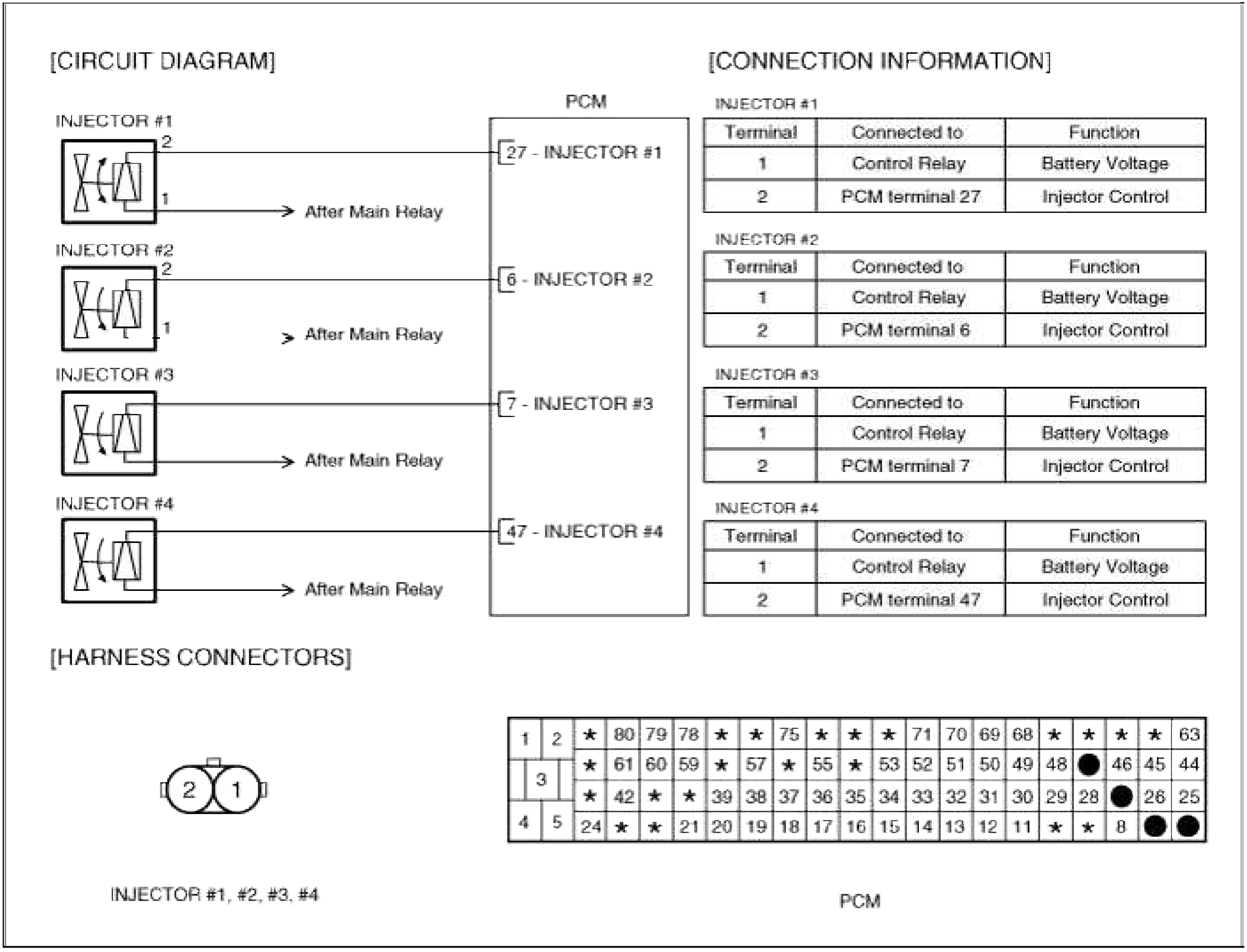
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
INJECTOR #1
2
1
After Main Relay
INJECTOR #2
2
1
After Main Relay
INJECTOR #3
After Main Relay
INJECTOR #4
After Main Relay
PCM
27 - INJECTOR #1
6 - INJECTOR #2
7 - INJECTOR #3
47 - INJECTOR #4
[HARNESS CONNECTORS]
2
1
INJECTOR #1, #2, #3, #4
PCM

[CONNECTION INFORMATION]

INJECTOR #1

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 27	Injector Control

INJECTOR #2

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 6	Injector Control

INJECTOR #3

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 7	Injector Control

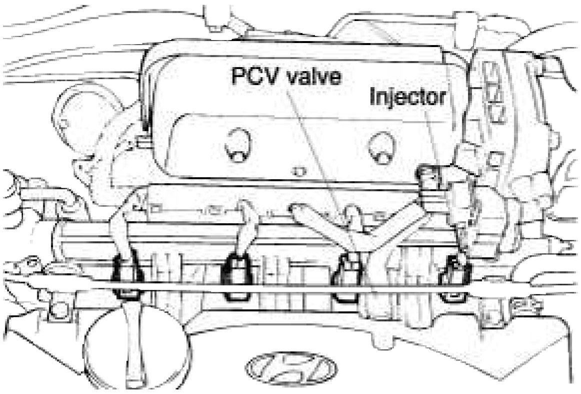
INJECTOR #4

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 47	Injector Control

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	●	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	●	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	●	●

Fuel System > Troubleshooting > P0267

COMPONENT LOCATION


PCV valve
Injector

GENERAL DESCTIPTION

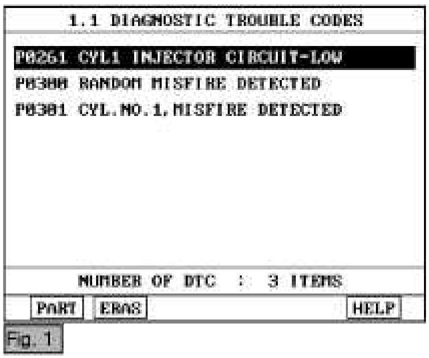
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, low	● Open in battery circuit ● Open in control circuit ● Short to ground in control circuit ● Faulty injector's ● Faulty PCM
Threshold value	● Shorted or disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe	● None	

MONITOR DTC STATUS

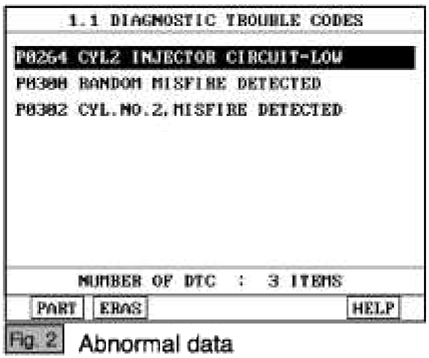
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "INJ duration" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0261 CYL1 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0301 CYL.NO.1,MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

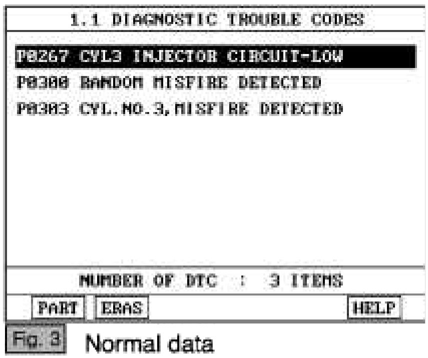
Fig. 1



```
1.1 DIAGNOSTIC TROUBLE CODES
P0264 CYL2 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0302 CYL.NO.2,MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

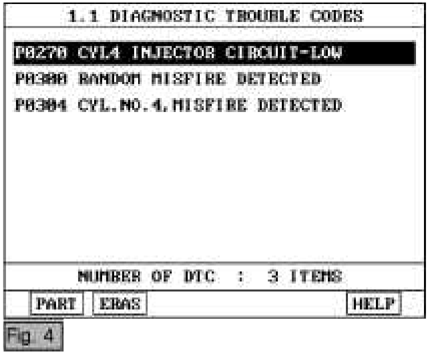
Fig. 2 Abnormal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0267 CYL3 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0303 CYL.NO.3,MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

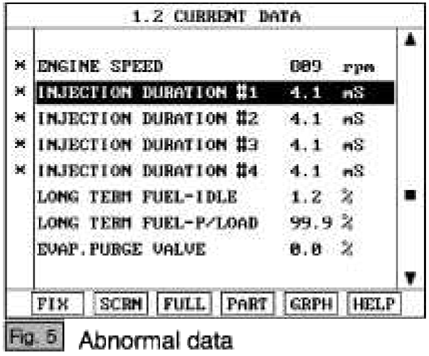
Fig. 3 Normal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0270 CYL4 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0304 CYL.NO.4,MISFIRE DETECTED

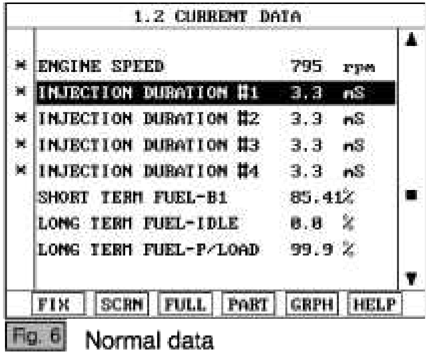
NUMBER OF DTC  :  3 ITEMS
```

Fig. 4



```
1.2 CURRENT DATA
* ENGINE SPEED              889  rpm
* INJECTION DURATION #1     4.1  mS
* INJECTION DURATION #2     4.1  mS
* INJECTION DURATION #3     4.1  mS
* INJECTION DURATION #4     4.1  mS
  LONG TERM FUEL-IDLE       1.2  %
  LONG TERM FUEL-P/LOAD     99.9 %
  EVAP.PURGE VALVE          0.0  %
```

Fig. 5 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED              795  rpm
* INJECTION DURATION #1     3.3  mS
* INJECTION DURATION #2     3.3  mS
* INJECTION DURATION #3     3.3  mS
* INJECTION DURATION #4     3.3  mS
  SHORT TERM FUEL-B1        85.41%
  LONG TERM FUEL-IDLE       0.0  %
  LONG TERM FUEL-P/LOAD     99.9 %
```

Fig. 6 Normal data

NOTE

The Injector operating time should be checked in P or N range, warmed-up and idling condition.
The data shown above is only for reference and there may be a little difference actually.

Service standard
In idling: 2.2 ~ 5.0ms
2500 rpm : 2.0 ~ 5.0ms

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

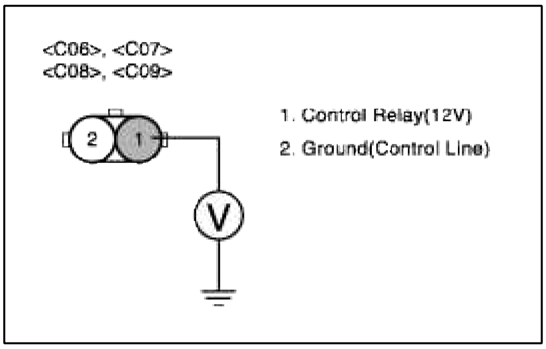
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect INJ connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

o to "Control circuit insepction" procedure.

NO

Open circuit or short circuit to chassis ground between INJ harness connector and control relay.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

> **NOTE**
>
> 1.In case the voltage between terminal 1 of injector and terminal 27,6,7 and 47 of PCM is 1V respectively.
>
> Suspect area : Open or short circuit of power line from injector to PCM.

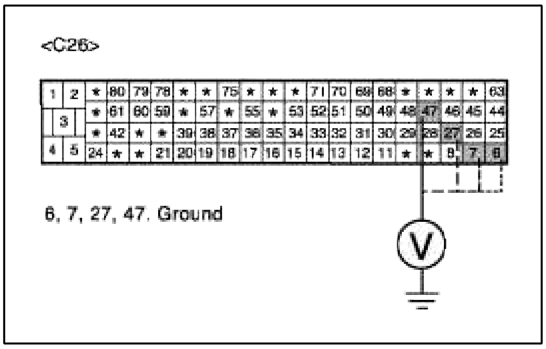
CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"

   (2) Connect INJ connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 27 of ECM harness connector and chassis ground..



   (5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

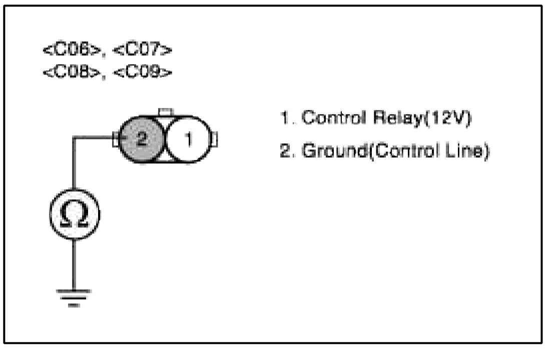
Open or Short circuit to chassis ground between INJ harness connector and PCM harness connector.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for short to ground in harness
   (1) Ignition "OFF"

   (2) Disconnect INJ connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure resistance between terminal 2 of sensor harness connector and chassis ground..



   (5) Is measure resistance within Specification?

YES

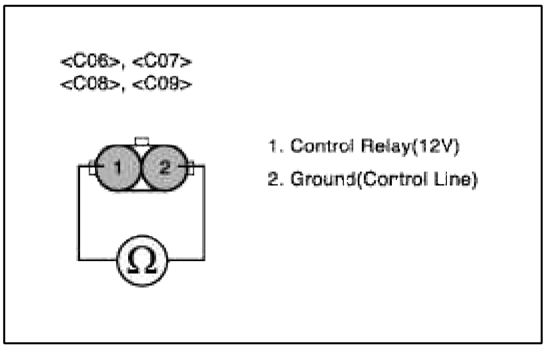
Go to "Component Inspection" procedure.

NO

Short circuit between injector control circuit and chassis ground.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check INJ
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good INJ and check for proper operation. If the problem is corrected, replace INJ and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

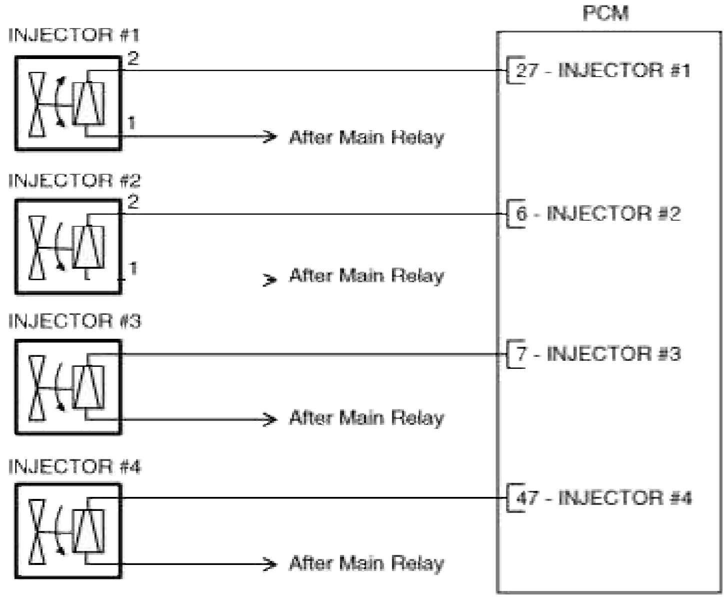
Go to the applicable troubleshooting procedure.

NO

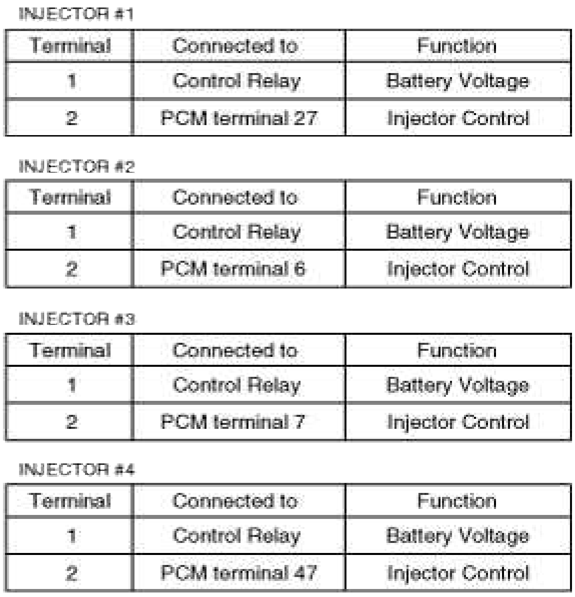
System is performing to specification at this time.

SCHEMATIC DIAGRAM

[CIRCUIT DIAGRAM]


PCM
INJECTOR #1
2
1
After Main Relay
27 - INJECTOR #1
INJECTOR #2
2
1
After Main Relay
6 - INJECTOR #2
INJECTOR #3
After Main Relay
7 - INJECTOR #3
INJECTOR #4
After Main Relay
47 - INJECTOR #4

[CONNECTION INFORMATION]


INJECTOR #1

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 27	Injector Control

INJECTOR #2

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 6	Injector Control

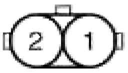
INJECTOR #3

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 7	Injector Control

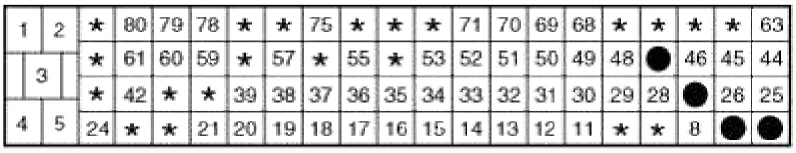
INJECTOR #4

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 47	Injector Control

[HARNESS CONNECTORS]



INJECTOR #1, #2, #3, #4

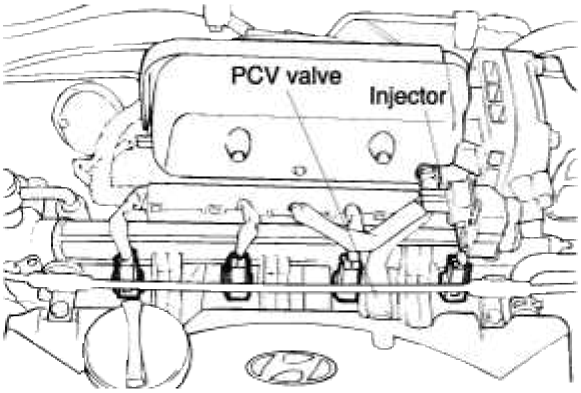


1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	●	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	●	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	●	●

PCM

Fuel System > Troubleshooting > P0268

COMPONENT LOCATION


PCV valve
Injector

GENERAL DESCTIPTION

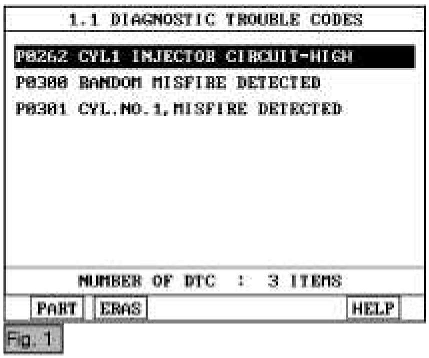
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, High	● Short to battery in control circuit ● Faulty injector's ● Faulty PCM
Threshold value	● Shorted or disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe	● None	

MONITOR DTC STATUS

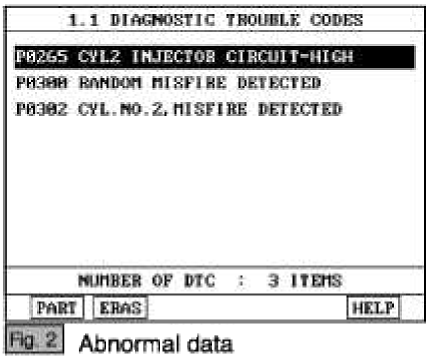
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "INJ duration" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0262 CYL1 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0301 CYL.NO.1,MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

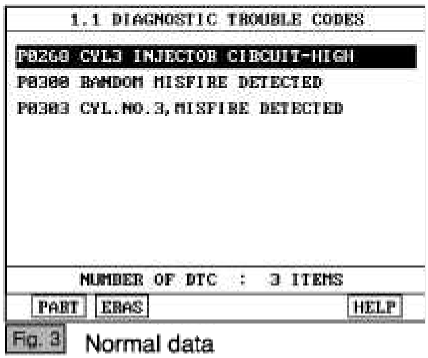
Fig. 1



```
1.1 DIAGNOSTIC TROUBLE CODES
P0265 CYL2 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0302 CYL.NO.2,MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

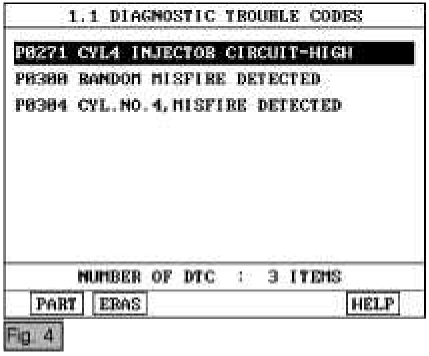
Fig. 2 Abnormal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0268 CYL3 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0303 CYL.NO.3,MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

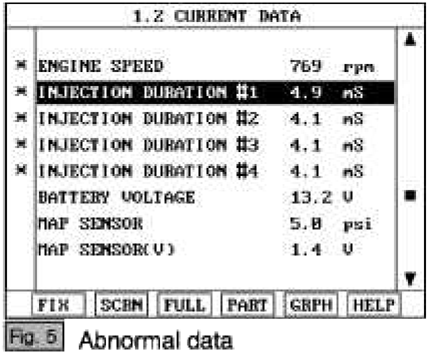
Fig. 3 Normal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0271 CYL4 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0304 CYL.NO.4,MISFIRE DETECTED

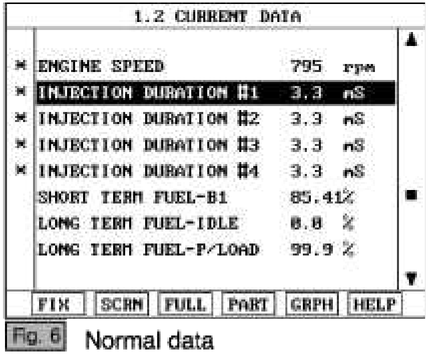
NUMBER OF DTC  :  3 ITEMS
```

Fig. 4



```
1.2 CURRENT DATA
* ENGINE SPEED            769  rpm
* INJECTION DURATION #1   4.9  mS
* INJECTION DURATION #2   4.1  mS
* INJECTION DURATION #3   4.1  mS
* INJECTION DURATION #4   4.1  mS
  BATTERY VOLTAGE         13.2 V
  MAP SENSOR              5.0  psi
  MAP SENSOR(V)           1.4  V
```

Fig. 5 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED            795  rpm
* INJECTION DURATION #1   3.3  mS
* INJECTION DURATION #2   3.3  mS
* INJECTION DURATION #3   3.3  mS
* INJECTION DURATION #4   3.3  mS
  SHORT TERM FUEL-B1      85.41%
  LONG TERM FUEL-IDLE     0.0  %
  LONG TERM FUEL-P/LOAD   99.9 %
```

Fig. 6 Normal data

NOTE

The Injector operating time should be checked in P or N range, warmed-up and idling condition.
The data shown above is only for reference and there may be a little difference actually.

Service standard
In idling: 2.2 ~ 5.0ms
2500 rpm : 2.0 ~ 5.0ms

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.
Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

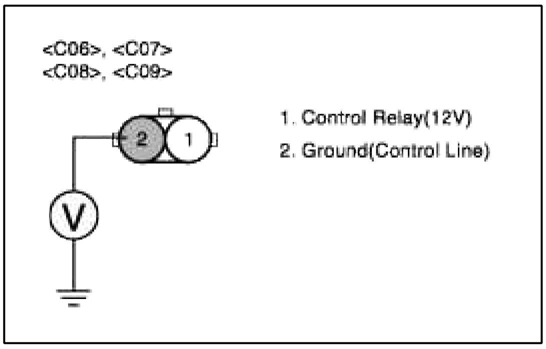
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

CONTROL CIRCUIT INSPECTION

1. Check for short to power in harness
   (1) Ignition "OFF"
   (2) Disconnect INJ connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector and chassis ground..



   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Short circuit to battery power 12V between injector harness connector and control relay.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

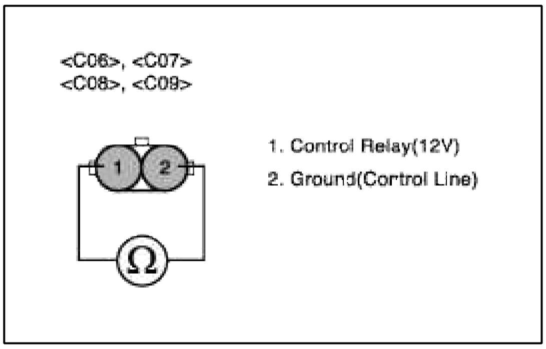
NOTE

In case the voltage of terminal 2 is measured 12V when the connector is disconnected.
Suspect area: Short to battery power line after fuse(15A for injector) when IG on.

COMPONENT INSPECTION

1. Check INJ

(1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



(2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good INJ and check for proper operation. If the problem is corrected, replace INJ and then go to "Verification of Vehicle Repair" procedure.

NOTE

The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

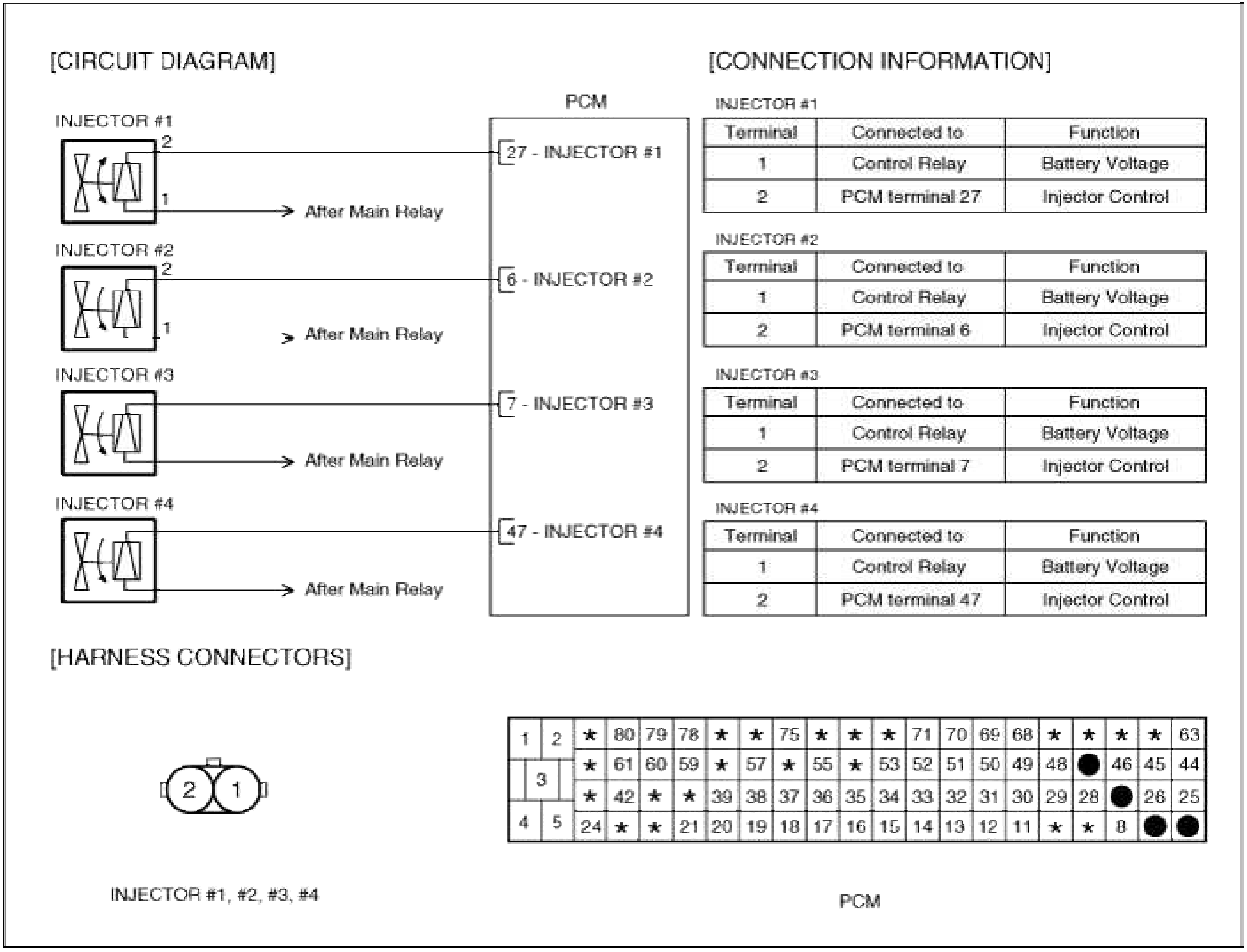
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
INJECTOR #1
2
1
After Main Relay
INJECTOR #2
2
1
After Main Relay
INJECTOR #3
After Main Relay
INJECTOR #4
After Main Relay
PCM
27 - INJECTOR #1
6 - INJECTOR #2
7 - INJECTOR #3
47 - INJECTOR #4
[HARNESS CONNECTORS]
2
1
INJECTOR #1, #2, #3, #4
PCM

[CONNECTION INFORMATION]

INJECTOR #1

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 27	Injector Control

INJECTOR #2

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 6	Injector Control

INJECTOR #3

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 7	Injector Control

INJECTOR #4

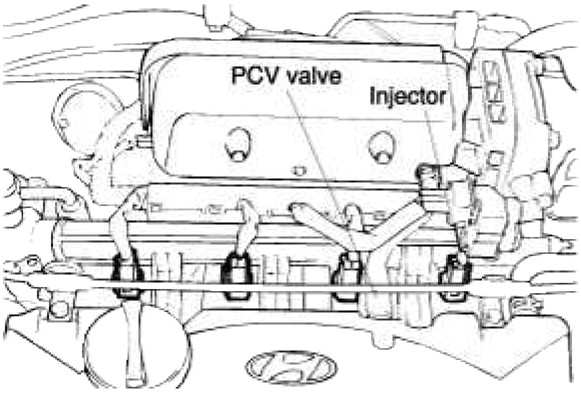
Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 47	Injector Control

PCM

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	●	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	●	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	●	●

Fuel System > Troubleshooting > P0270

COMPONENT LOCATION


PCV valve
Injector

GENERAL DESCTIPTION

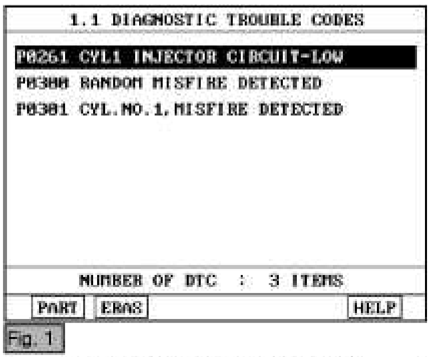
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, low	● Open in battery circuit ● Open in control circuit ● Short to ground in control circuit ● Faulty injector's ● Faulty PCM
Threshold value	● Shorted or disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe	● None	

MONITOR DTC STATUS

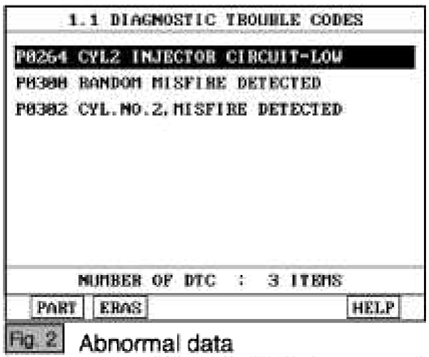
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "INJ duration" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0261 CYL1 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0301 CYL.NO.1.MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

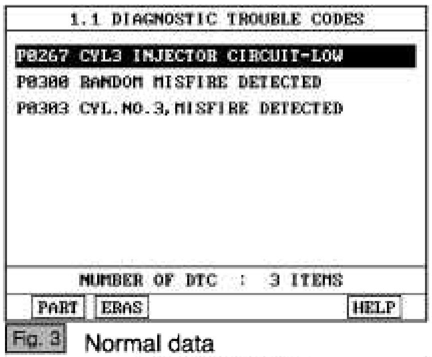
Fig. 1



```
1.1 DIAGNOSTIC TROUBLE CODES
P0264 CYL2 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0302 CYL.NO.2.MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

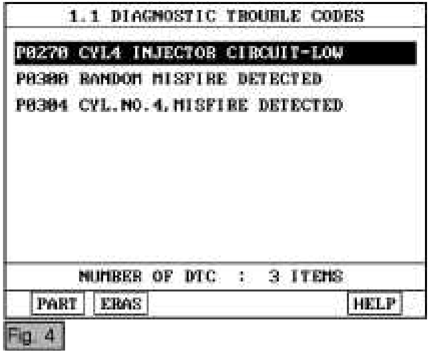
Fig. 2 Abnormal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0267 CYL3 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0303 CYL.NO.3.MISFIRE DETECTED

NUMBER OF DTC  :  3 ITEMS
```

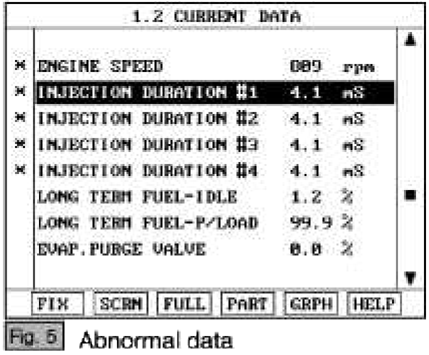
Fig. 3 Normal data



```
1.1 DIAGNOSTIC TROUBLE CODES
P0270 CYL4 INJECTOR CIRCUIT-LOW
P0300 RANDOM MISFIRE DETECTED
P0304 CYL.NO.4.MISFIRE DETECTED

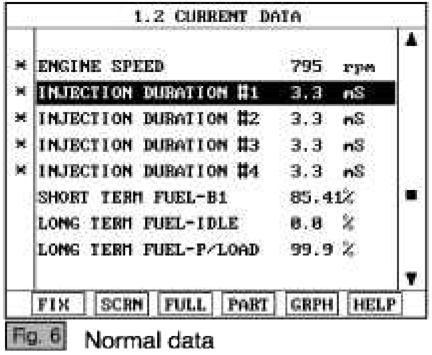
NUMBER OF DTC  :  3 ITEMS
```

Fig. 4



```
1.2 CURRENT DATA
* ENGINE SPEED               089  rpm
* INJECTION DURATION #1      4.1  mS
* INJECTION DURATION #2      4.1  mS
* INJECTION DURATION #3      4.1  mS
* INJECTION DURATION #4      4.1  mS
  LONG TERM FUEL-IDLE        1.2  %
  LONG TERM FUEL-P/LOAD      99.9 %
  EVAP.PURGE VALVE           0.0  %
```

Fig. 5 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED               795  rpm
* INJECTION DURATION #1      3.3  mS
* INJECTION DURATION #2      3.3  mS
* INJECTION DURATION #3      3.3  mS
* INJECTION DURATION #4      3.3  mS
  SHORT TERM FUEL-B1         85.41%
  LONG TERM FUEL-IDLE        0.0  %
  LONG TERM FUEL-P/LOAD      99.9 %
```

Fig. 6 Normal data

1.

> NOTE
>
> The Injector operating time should be checked in P or N range, warmed-up and idling condition.
> The data shown above is only for reference and there may be a little difference actually.

Service standard
In idling: 2.2 ~ 5.0ms
2500 rpm : 2.0 ~ 5.0ms

2. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

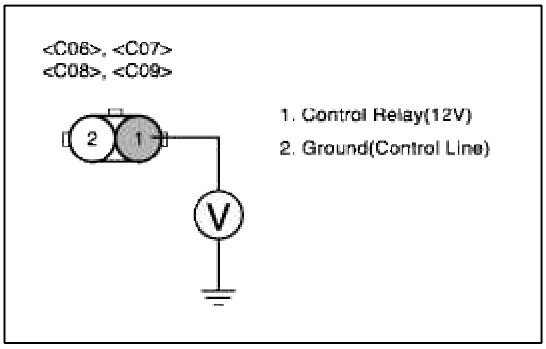
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect INJ connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

Open circuit or short circuit to chassis ground between INJ harness connector and control relay.

Repair as necessary and go to "Verification Vehicle Repair" procedure.

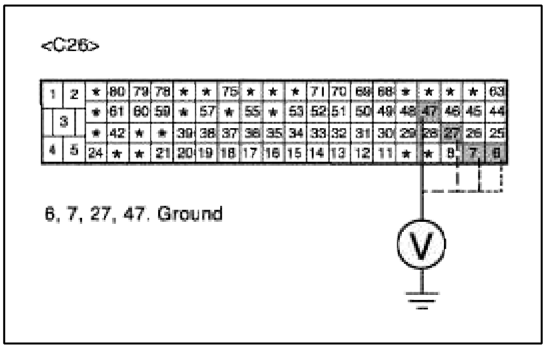
NOTE

1.In case the voltage between terminal 1 of injector and terminal 27,6,7 and 47 of PCM is 1V respectively.

Suspect area : Open or short circuit of power line from injector to PCM.

CONTROL CIRCUIT INSPECTION

1. Check for open in harness
    (1) Ignition "OFF"
    (2) Connect INJ connector and PCM connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure voltage between terminal 27 of ECM harness connector and chassis ground..


<C26>
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
6, 7, 27, 47. Ground
V

    (5) Is measure voltage within Specification?

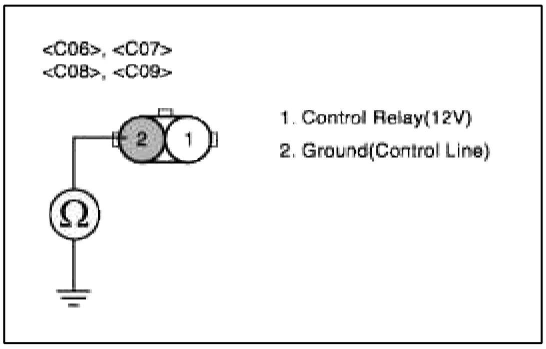
YES

Go to "Check for short to ground in harness " as below.

NO

Open or Short circuit to chassis ground between INJ harness connector and PCM harness connector.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for short to ground in harness
    (1) Ignition "OFF"
    (2) Disconnect INJ connector and PCM connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure resistance between terminal 2 of sensor harness connector and chassis ground..


<C06>, <C07>
<C08>, <C09>
2
1
1. Control Relay(12V)
2. Ground(Control Line)
Ω

    (5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

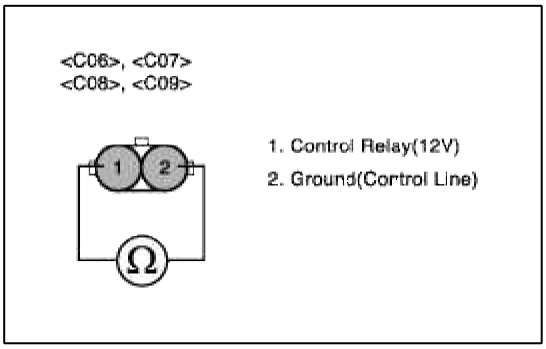
NO

Short circuit between injector control circuit and chassis ground.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check INJ

   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good INJ and check for proper operation. If the problem is corrected, replace INJ and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

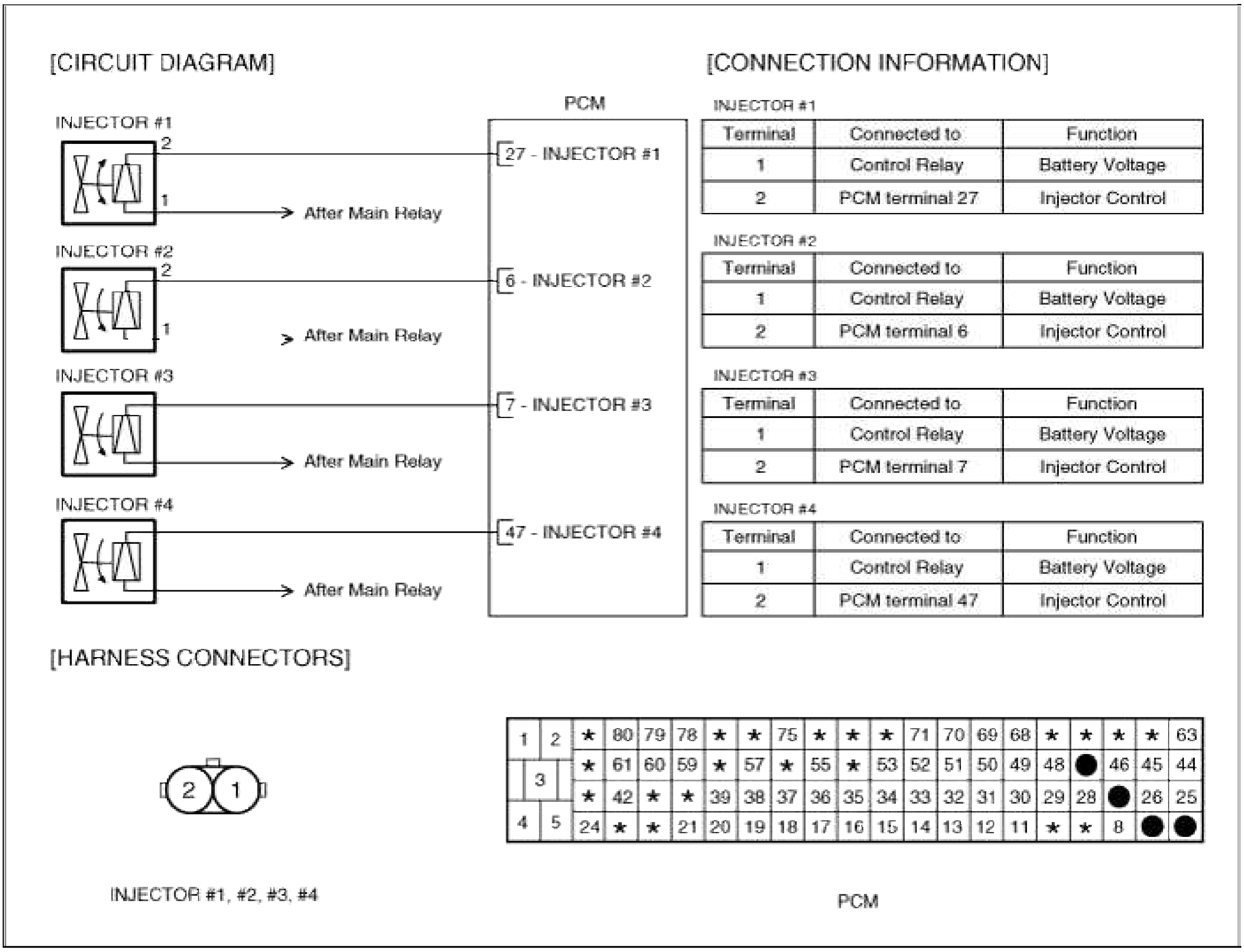
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM



[CIRCUIT DIAGRAM]

PCM
INJECTOR #1
2
1
After Main Relay
27 - INJECTOR #1
INJECTOR #2
2
1
After Main Relay
6 - INJECTOR #2
INJECTOR #3
After Main Relay
7 - INJECTOR #3
INJECTOR #4
After Main Relay
47 - INJECTOR #4

[CONNECTION INFORMATION]

INJECTOR #1

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 27	Injector Control

INJECTOR #2

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 6	Injector Control

INJECTOR #3

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 7	Injector Control

INJECTOR #4

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 47	Injector Control

[HARNESS CONNECTORS]

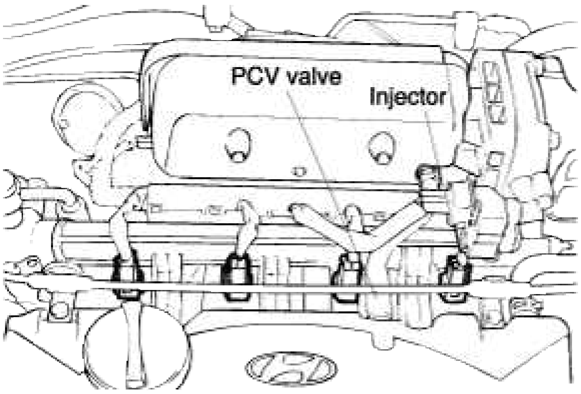
INJECTOR #1, #2, #3, #4

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	●	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	●	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	●	●

PCM

Fuel System > Troubleshooting > P0271

COMPONENT LOCATION



PCV valve
Injector

GENERAL DESCTIPTION

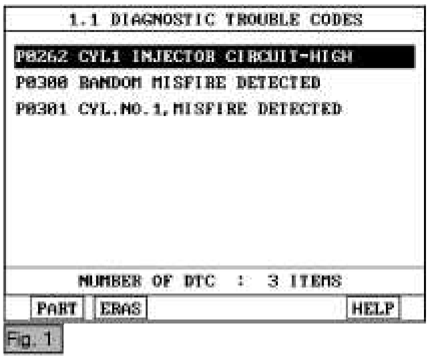
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, High	● Short to battery in control circuit ● Faulty injector's ● Faulty PCM
Threshold value	● Shorted or disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continuous	
Fail Safe	● None	

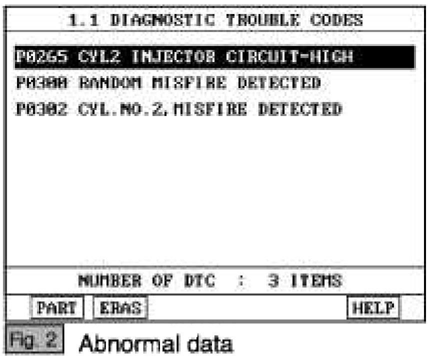
MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "INJ duration" parameter on the scantool.



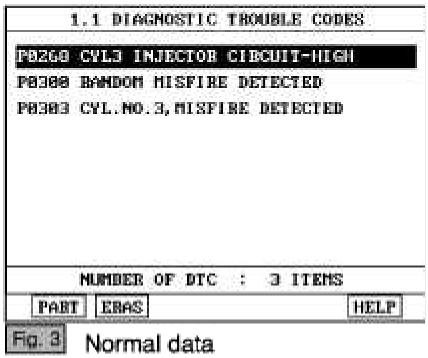
```
1.1 DIAGNOSTIC TROUBLE CODES
P0262 CYL1 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0301 CYL.NO.1,MISFIRE DETECTED
NUMBER OF DTC  :  3 ITEMS
```

Fig. 1



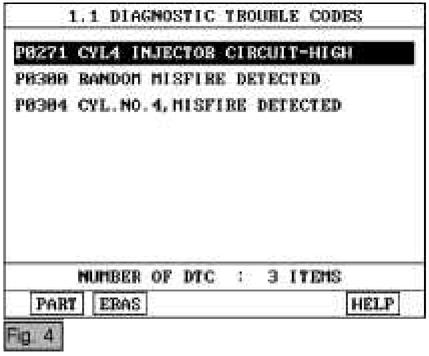
```
1.1 DIAGNOSTIC TROUBLE CODES
P0265 CYL2 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0302 CYL.NO.2,MISFIRE DETECTED
NUMBER OF DTC  :  3 ITEMS
```

Fig. 2 Abnormal data



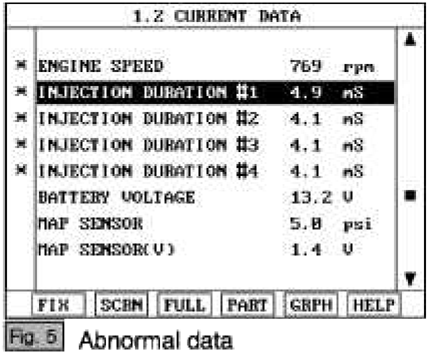
```
1.1 DIAGNOSTIC TROUBLE CODES
P0268 CYL3 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0303 CYL.NO.3,MISFIRE DETECTED
NUMBER OF DTC  :  3 ITEMS
```

Fig. 3 Normal data



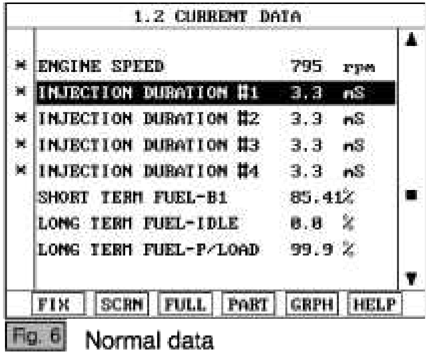
```
1.1 DIAGNOSTIC TROUBLE CODES
P0271 CYL4 INJECTOR CIRCUIT-HIGH
P0300 RANDOM MISFIRE DETECTED
P0304 CYL.NO.4,MISFIRE DETECTED
NUMBER OF DTC  :  3 ITEMS
```

Fig. 4



```
1.2 CURRENT DATA
* ENGINE SPEED              769  rpm
* INJECTION DURATION #1     4.9  mS
* INJECTION DURATION #2     4.1  mS
* INJECTION DURATION #3     4.1  mS
* INJECTION DURATION #4     4.1  mS
  BATTERY VOLTAGE           13.2 V
  MAP SENSOR                5.0  psi
  MAP SENSOR(V)             1.4  V
```

Fig. 5 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED              795  rpm
* INJECTION DURATION #1     3.3  mS
* INJECTION DURATION #2     3.3  mS
* INJECTION DURATION #3     3.3  mS
* INJECTION DURATION #4     3.3  mS
  SHORT TERM FUEL-B1        85.41%
  LONG TERM FUEL-IDLE       0.0  %
  LONG TERM FUEL-P/LOAD     99.9 %
```

Fig. 6 Normal data

NOTE

The Injector operating time should be checked in P or N range, warmed-up and idling condition.
The data shown above is only for reference and there may be a little difference actually.

Service standard
In idling: 2.2 ~ 5.0ms
2500 rpm : 2.0 ~ 5.0ms

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

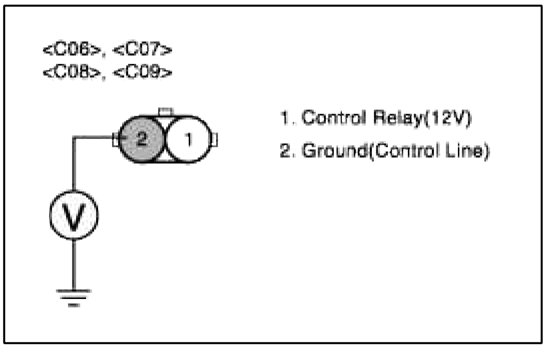
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

CONTROL CIRCUIT INSPECTION

1. Check for short to power in harness
   (1) Ignition "OFF"
   (2) Disconnect INJ connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector and chassis ground..



   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

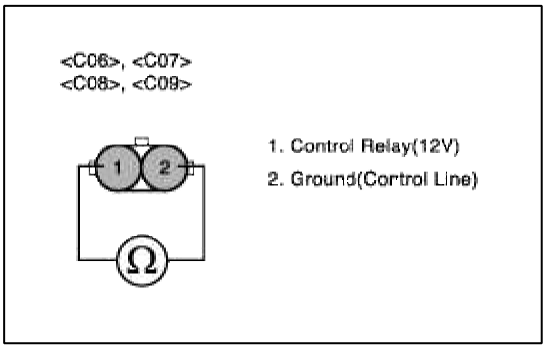
NO

Short circuit to battery power 12V between injector harness connector and control relay.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

> **NOTE**
>
> 1.In case the voltage of terminal 2 is measured 12V when the connector is disconnected.
> Suspect area: Short to battery power line after fuse(15A for injector) when IG on.

COMPONENT INSPECTION

1. Check INJ
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good INJ and check for proper operation. If the problem is corrected, replace INJ and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> The purpose of measuring injector resistance is to find if the open circuit is in the component.So,check the continuity between signal line and ground line.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

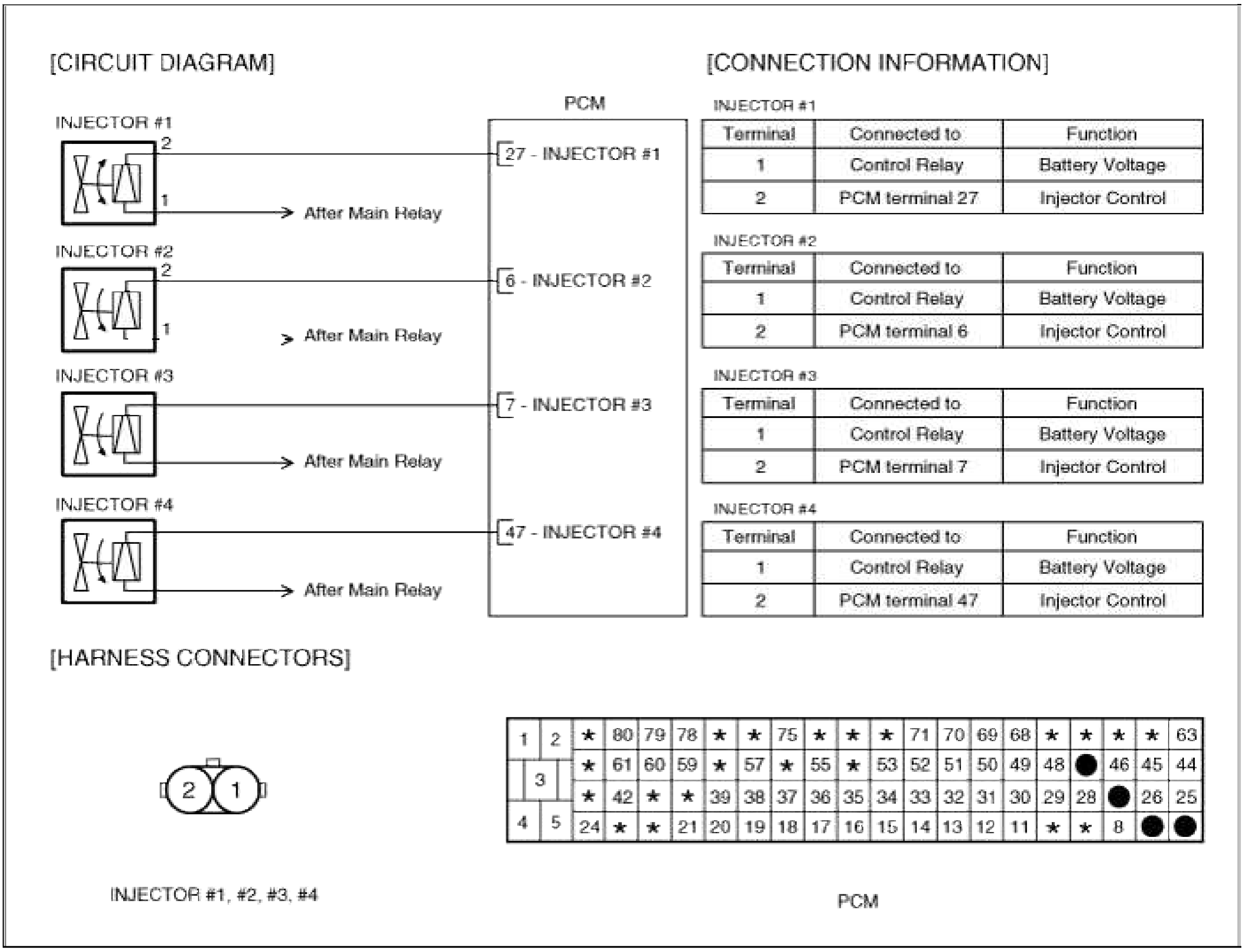
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
INJECTOR #1
2
1
After Main Relay
INJECTOR #2
2
1
After Main Relay
INJECTOR #3
After Main Relay
INJECTOR #4
After Main Relay
PCM
27 - INJECTOR #1
6 - INJECTOR #2
7 - INJECTOR #3
47 - INJECTOR #4
[HARNESS CONNECTORS]
2
1
INJECTOR #1, #2, #3, #4
PCM

[CONNECTION INFORMATION]

INJECTOR #1

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 27	Injector Control

INJECTOR #2

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 6	Injector Control

INJECTOR #3

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 7	Injector Control

INJECTOR #4

Terminal	Connected to	Function
1	Control Relay	Battery Voltage
2	PCM terminal 47	Injector Control

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	●	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	●	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	●	●

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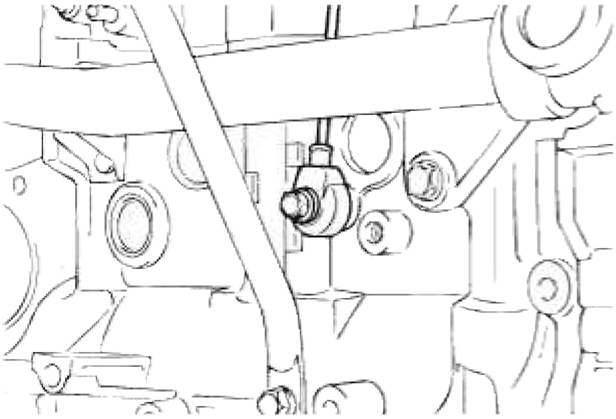
COMPONENT LOCATION



GENERAL DESCTIPTION

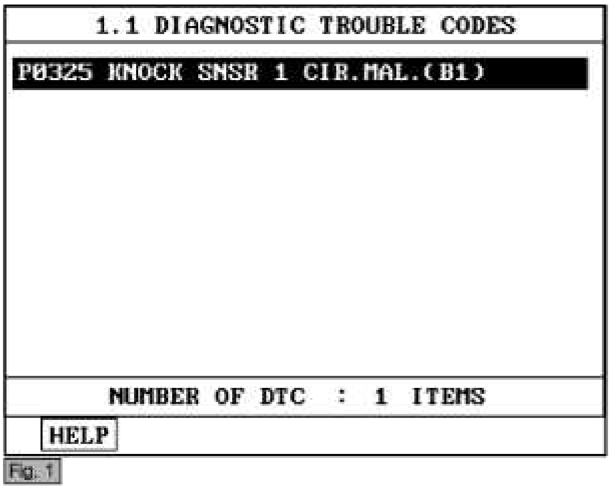
DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
Case1	Monitoring Strategy	● Signal check	● Short to ground in signal circuit ● Open in signal circuit ● Faulty Knock sensor ● Faulty PCM
	Threshold value	● Reference level voltage : < lower limit,f(rpm) ● Reference level voltage : < higher limit,f(rpm)	
	Enable Conditions	● Engine speed > 2120 rpm ● Knock control enabled ● No dynamic knock control	
Case2	Monitoring Strategy	● Circuit continuity check, pulse test	
	Threshold value	● Integrator value difference(End value - Startvalue) : <3.7V	
Case3	Monitoring Strategy	● Circuit continuity check, zero test	
	Threshold value	● Integrator offset : > 0.234V ● Intergator grasient : > 40 ~ 60V/sec	
Enable Conditions		● Engine speed 1200-5200 rpm	
Diagnostic Time		● Continuous	
Fail Safe		● The ignition angle correction is determined by function of engine speed, mass air fiow.	

MONITOR DTC STATUS

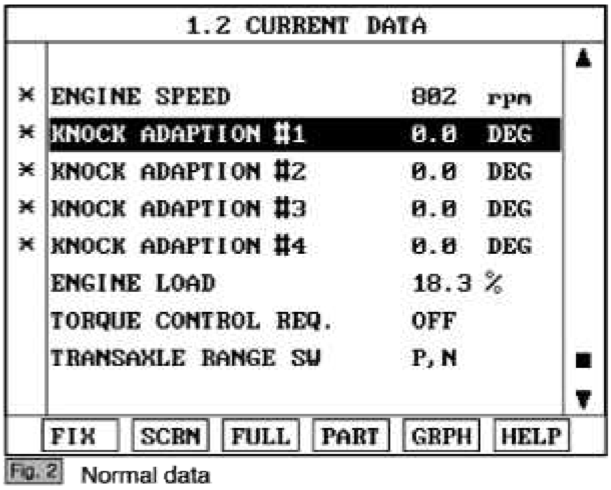
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ignition timing" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0325 KNOCK SNSR 1 CIR.MAL.(B1)

NUMBER OF DTC  :  1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
× ENGINE SPEED           802  rpm
× KNOCK ADAPTION #1      0.0  DEG
× KNOCK ADAPTION #2      0.0  DEG
× KNOCK ADAPTION #3      0.0  DEG
× KNOCK ADAPTION #4      0.0  DEG
  ENGINE LOAD            18.3 %
  TORQUE CONTROL REQ.    OFF
  TRANSAXLE RANGE SW     P,N
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification
Idle : 0 ~ 20° BTDC
3000 rpm : 29 ~ 49° BTDC

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

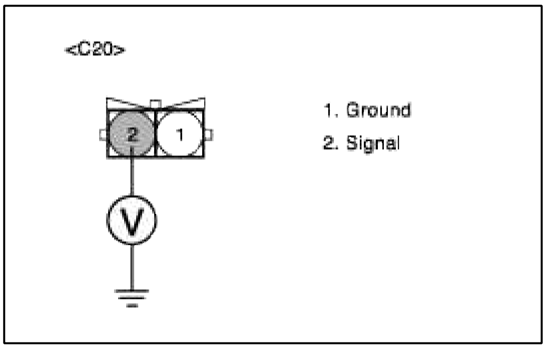
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect Knock sensor connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector and chassis ground.



(5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

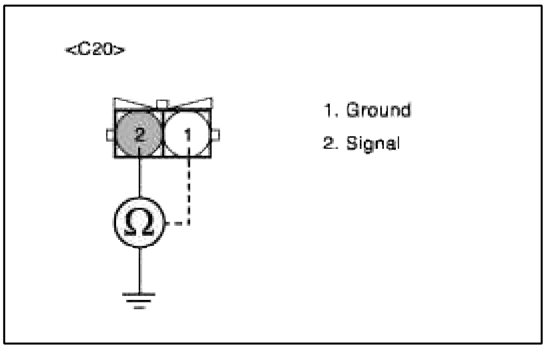
In case over 5V : Short circuit to battery between Knock sensor harness connector and PCM harness connector.

In case 0V: Open or Short circuit between Knock sensor harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when knock sensor connector is disconnected,the voltage at terminal 1 is 0V.
>
> Possible cause : Open or short to ground and faulty PCM.

2. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect Knock sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 2 of sensor harness connector and chassis ground.
   (5) Measure resistance between terminal 1 and 2 of sensor harness connector.



(6) Is measure resistance within Specification?

YES

Go to "Ground Circuit Inspection" procedure.

NO

Short circuit to chassis ground between Knock sensor harness connector and PCM harness connector.

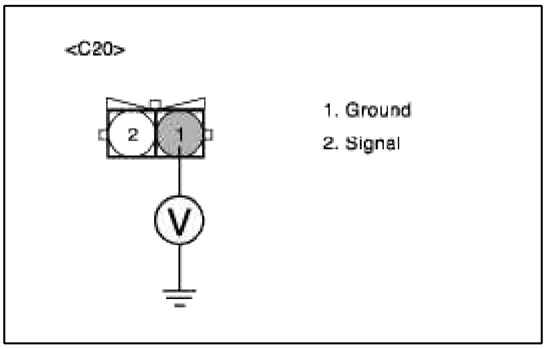
Short circuit between Knock sensor signal line and ground line.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect Knock sensor connector.
3. Ignition "ON" & Engine "OFF"

4. Measure resistance or voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

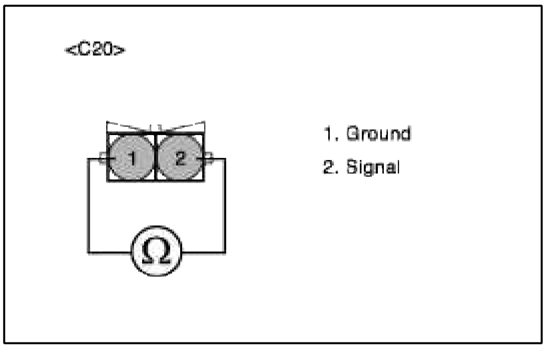
Open circuit between Knock sensor harness connector and PCM harness connector.
Open circuit between PCM harness connector and chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when checking the open ground circuit,the resistance is infinite.
Possible cause : Open circuit in ground line.

COMPONENT INSPECTION

1. Check Knock sensor
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



(2) Does each resistance indicate continuity circuit?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Knock sensor and check for proper operation. If the problem is corrected, replace Knock sensor and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

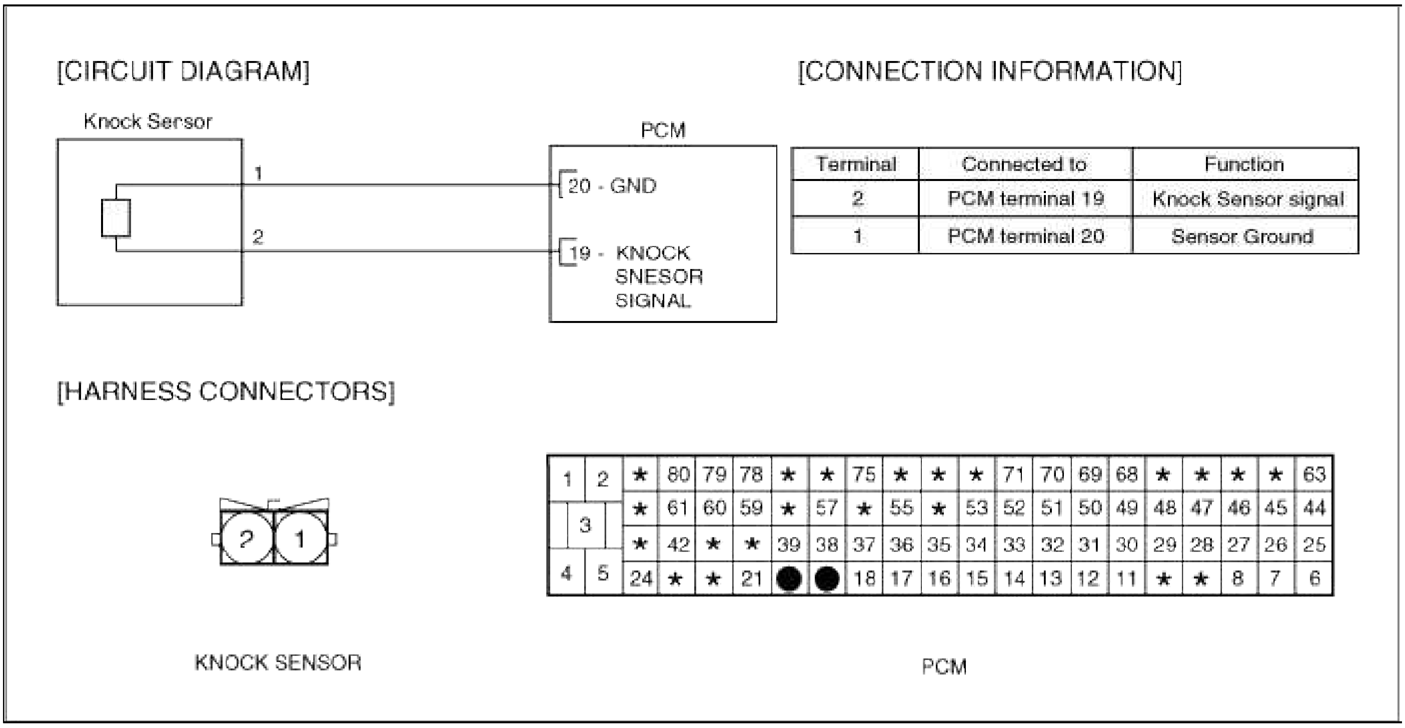
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
Knock Sensor
1
2
PCM
20 - GND
19 - KNOCK SNESOR SIGNAL
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
2
1
KNOCK SENSOR
PCM

Terminal	Connected to	Function
2	PCM terminal 19	Knock Sensor signal
1	PCM terminal 20	Sensor Ground

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	●	●	18	17	16	15	14	13	12	11	★	★	8	7	6

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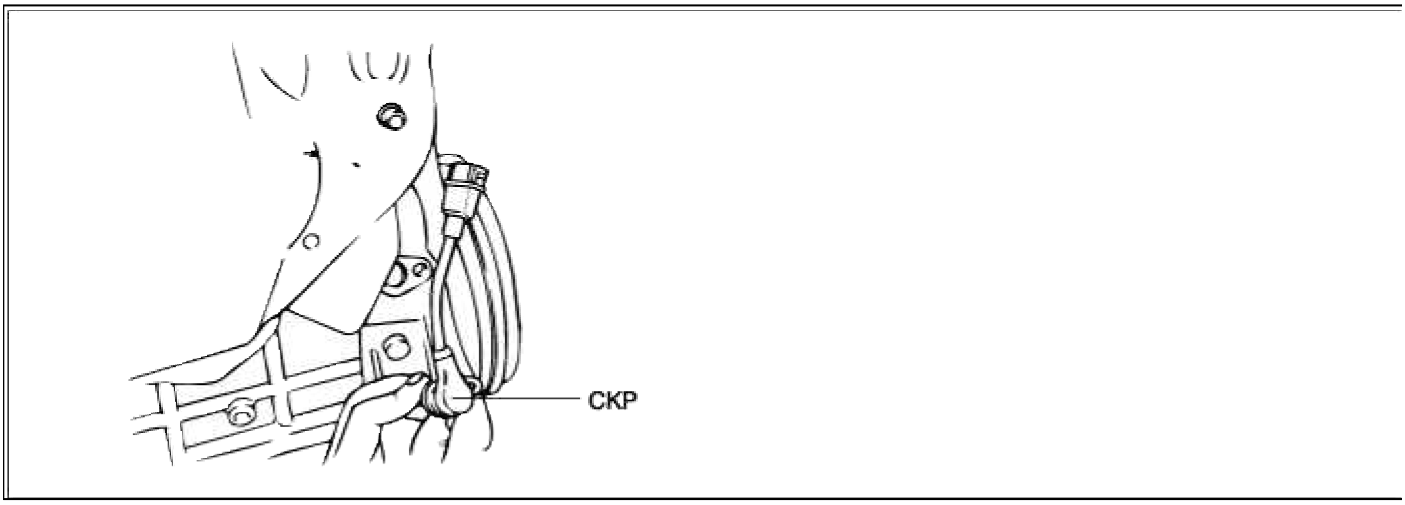
COMPONENT LOCATION



GENERAL DESCTIPTION

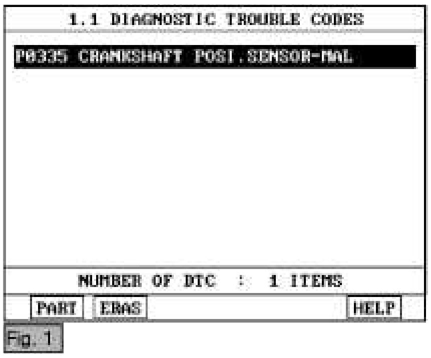
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check	● Open in signal circuit ● Open in ground circuit (pin 34 to 15) ● Faulty CKPS ● Faulty PCM
Threshold value	● No signal during cranking : 8 times	
Enable Conditions	● Phase sensor signal enabled	
Diagnostic Time	● Cranking	
Fail Safe	● None	

MONITOR DTC STATUS

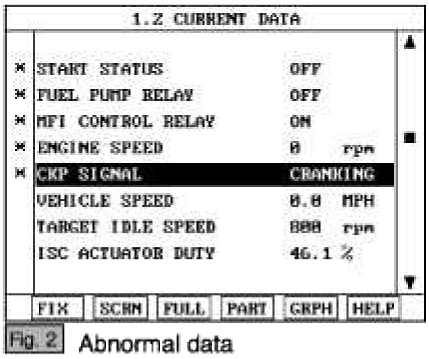
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "CKPS signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0335 CRANKSHAFT POSI.SENSOR-MAL

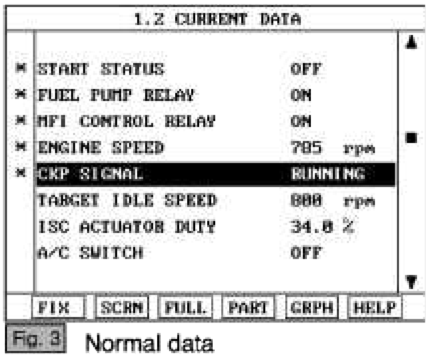
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* START STATUS          OFF
* FUEL PUMP RELAY       OFF
* MFI CONTROL RELAY     ON
* ENGINE SPEED          0     rpm
* CKP SIGNAL            CRANKING
  VEHICLE SPEED         0.0   MPH
  TARGET IDLE SPEED     800   rpm
  ISC ACTUATOR DUTY     46.1 %
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* START STATUS          OFF
* FUEL PUMP RELAY       ON
* MFI CONTROL RELAY     ON
* ENGINE SPEED          785   rpm
* CKP SIGNAL            RUNNING
  TARGET IDLE SPEED     800   rpm
  ISC ACTUATOR DUTY     34.0 %
  A/C SWITCH            OFF
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification
Engine running : on

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

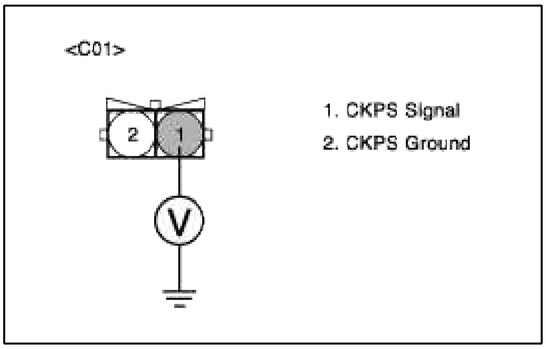
1. Check for open in harness

(1) Ignition "OFF"

(2) Disconnect CKP sensor connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure voltage between terminal 1 of sensor harness connector and chassis ground.



(5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

Open circuit or short circuit to chassis ground between CKPS harness connector and ECM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure

> **NOTE**
>
> In case,when CKPS connector is disconnected,the voltage at terminal 1 is 0V.
> Possible cause : Open circuit in signal line or faulty PCM

2. Check for short to ground in harness

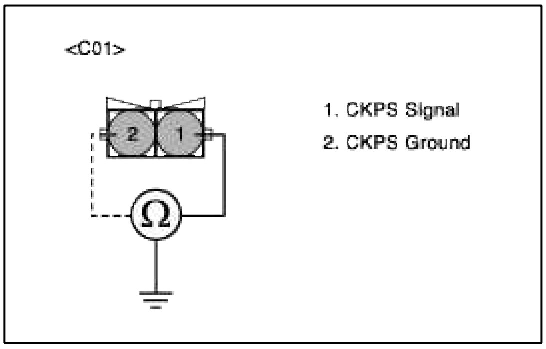
(1) Ignition "OFF"

(2) Disconnect CKP sensor connector and PCM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure resistance between terminal 1 of sensor harness connector and chassis ground.

(5) Measure resistance between terminal 1 and 2 of sensor harness connector.



(6) Is measure resistance within Specification?

YES

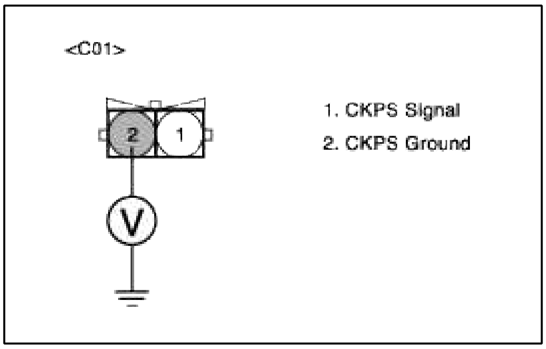
Go to "Ground Circuit Inspection" procedure.

NO

Short circuit to chassis ground between CKPS harness connector and PCM harness connector.
Short circuit between CKPS signal circuit and ground circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect CKP sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit or short circuit to chassis ground between CKPS harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when CKPS connector is disconnected,the voltage at terminal 2 is 0V.
Possible cause : Open circuit in ground line or faulty PCM

COMPONENT INSPECTION

1. Check PCM

The purpose of checking PCM is to determine whether there is any malfunction of PCM .

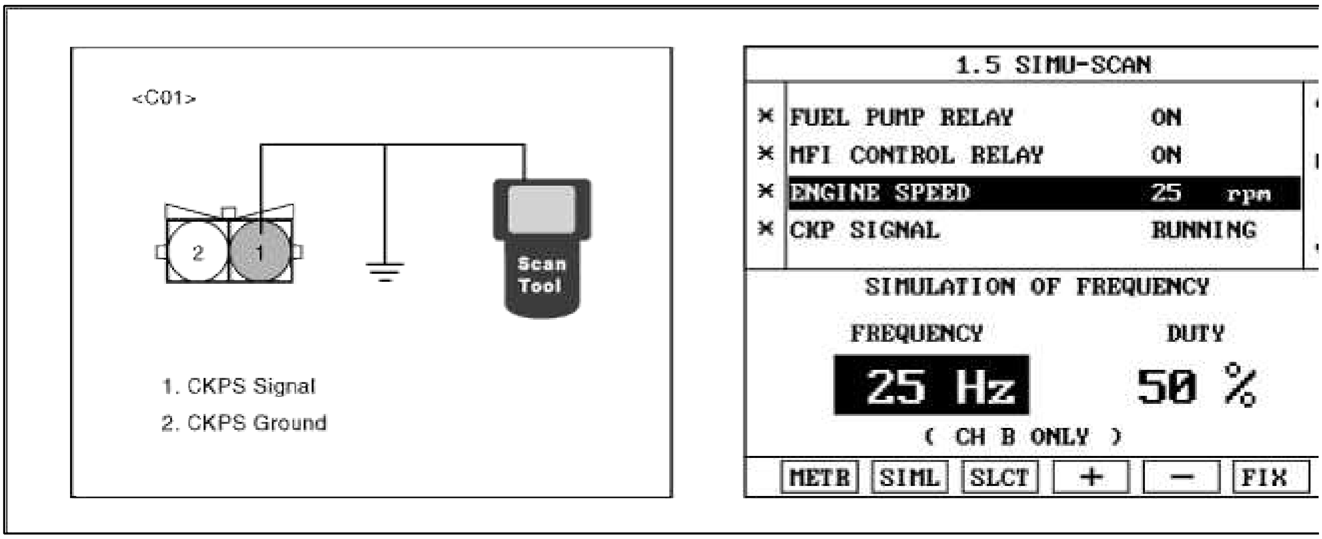
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate frequency at terminal 1 of CKP sensor signal connector.

(5) Verify CKPS frequency to change while raising or lowering simulation frequency with scan tool within 25 Hz



1.5 SIMU-SCAN

× FUEL PUMP RELAY ON
× MFI CONTROL RELAY ON
× ENGINE SPEED 25 rpm
× CKP SIGNAL RUNNING

SIMULATION OF FREQUENCY

FREQUENCY 25 Hz
DUTY 50 %
(CH B ONLY)

(6) Is injector operating sound heard in propotion to simulation frequency ?

YES

Check CKPS for contamination, deterioration, or damage. Clean CKPS with suitable cleaner as necessary air dry before reinstalling. If problem still exists, Substitute with a known-good CKPS and check for proper operation.

If the problem is corrected, replace CKPS and then go to "Verification of vehicle Repair" procedure

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

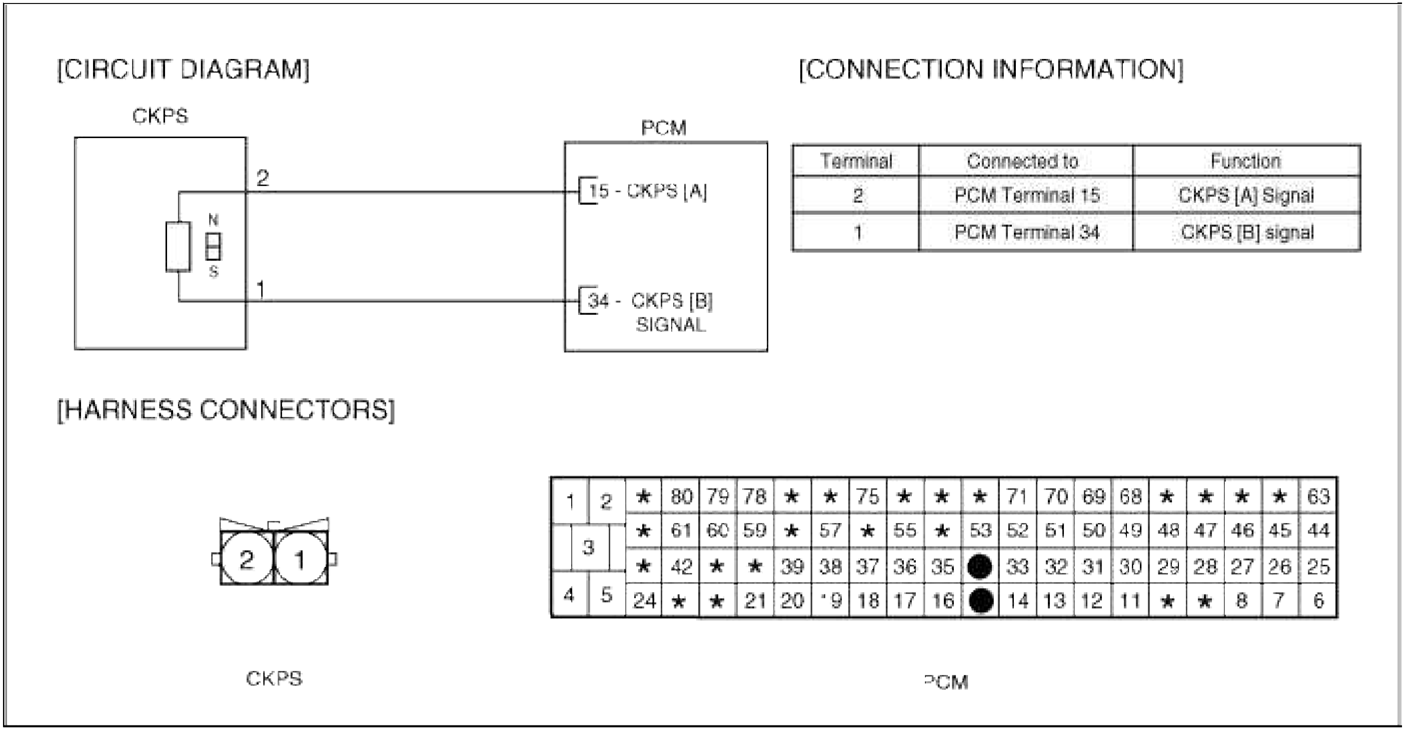
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

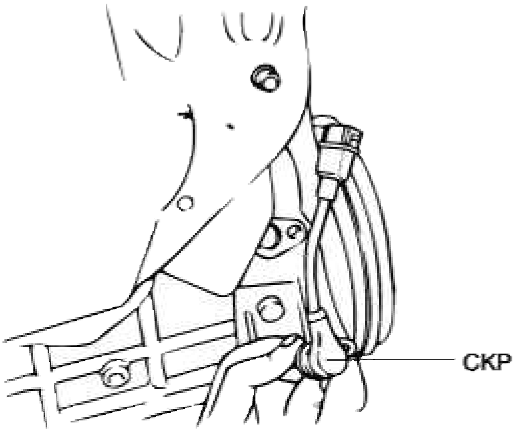

[CIRCUIT DIAGRAM]
CKPS
2
N
S
1
PCM
15 - CKPS [A]
34 - CKPS [B] SIGNAL
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
2
1
CKPS
PCM

Terminal	Connected to	Function
2	PCM Terminal 15	CKPS [A] Signal
1	PCM Terminal 34	CKPS [B] signal

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	●	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	●	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0336

COMPONENT LOCATION



GENERAL DESCTIPTION

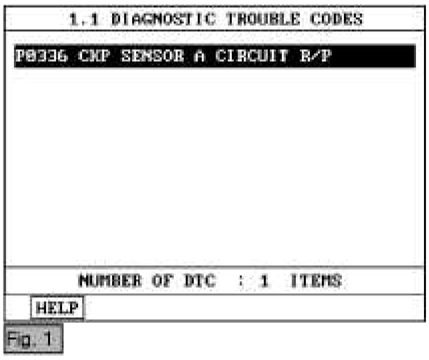
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Reference mark check	● poor connections ● Faulty target wheel tolerance ● Out of allowable air gap ● Faulty CKPS ● Faulty PCM
Threshold value	● No reference mark : > 20times	
Enable Conditions	● Vehicle speed < 1 kph(0.621371 mile) or > 25 kph(15.53428 mile) ● Idle engine speed > Target speed - 100 rpm	
Diagnostic Time	● Continuous	
Fail Safe	● None	

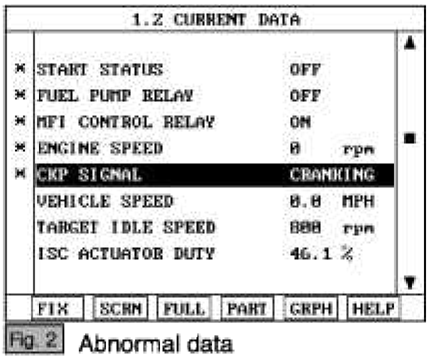
MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "CKPS signal" parameter on the scantool.



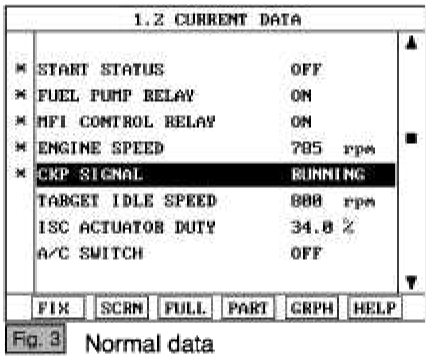
```
1.1 DIAGNOSTIC TROUBLE CODES
P0336 CKP SENSOR A CIRCUIT R/P
NUMBER OF DTC  :  1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* START STATUS          OFF
* FUEL PUMP RELAY       OFF
* MFI CONTROL RELAY     ON
* ENGINE SPEED          0     rpm
* CKP SIGNAL            CRANKING
  VEHICLE SPEED         0.0   MPH
  TARGET IDLE SPEED     800   rpm
  ISC ACTUATOR DUTY     46.1  %
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* START STATUS          OFF
* FUEL PUMP RELAY       ON
* MFI CONTROL RELAY     ON
* ENGINE SPEED          785   rpm
* CKP SIGNAL            RUNNING
  TARGET IDLE SPEED     800   rpm
  ISC ACTUATOR DUTY     34.0  %
  A/C SWITCH            OFF
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Specification

Engine running : on

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

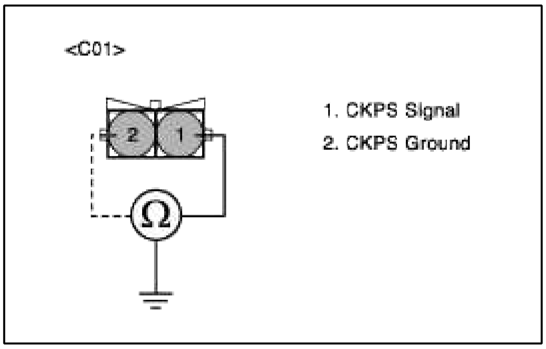
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect CKP sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 of sensor harness connector and chassis ground.
   (5) Measure resistance between terminal 1 and 2 of sensor harness connector.



   (6) Is measure resistance within Specification?

YES

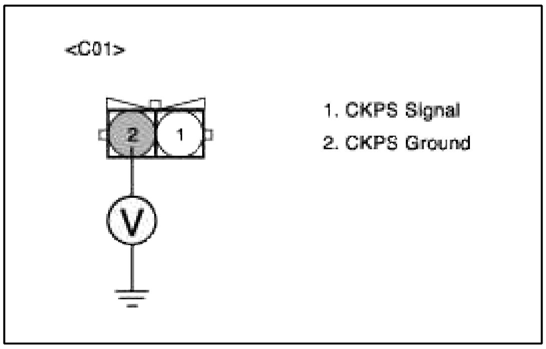
Go to "Ground Circuit Inspection" procedure.

NO

Short circuit to chassis ground between CKPS harness connector and PCM harness connector.
Short circuit between CKPS signal circuit and ground circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect CKP sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

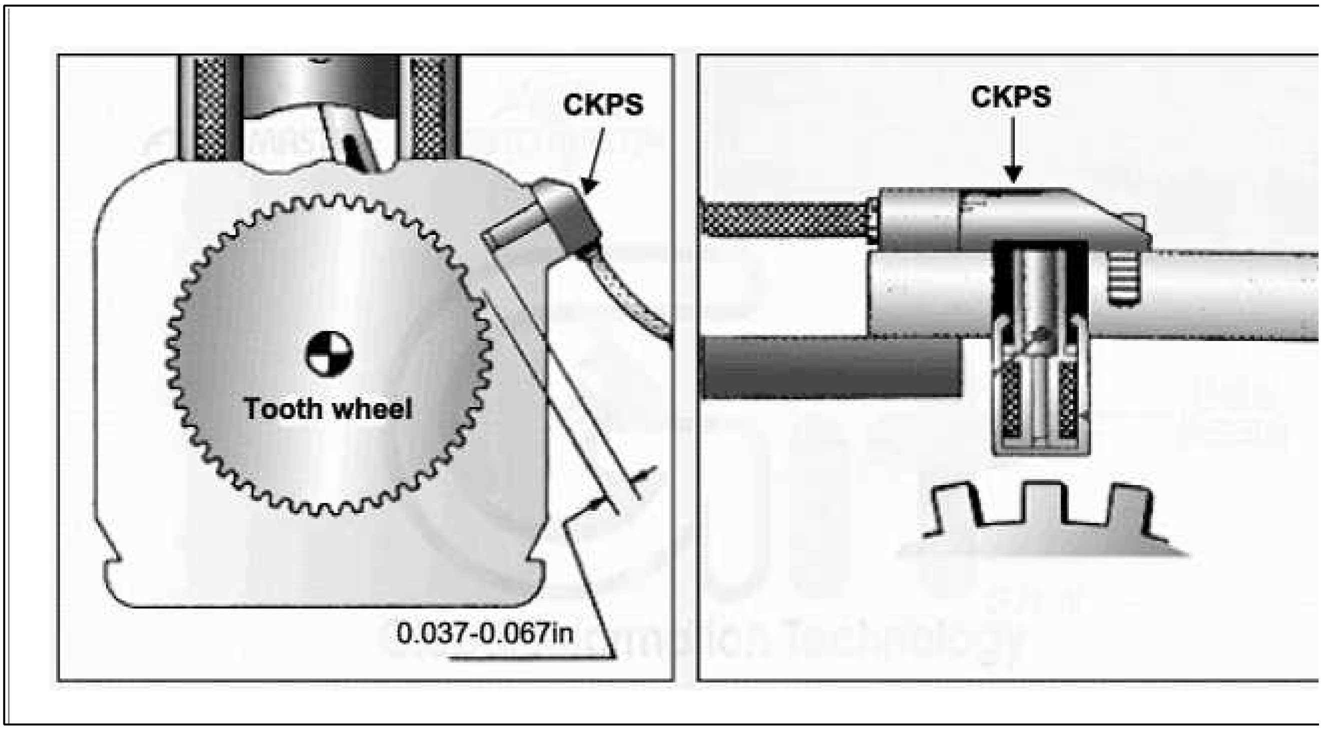
Open circuit or short circuit to chassis ground between CKPS harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when CKPS connector is disconnected,the voltage at terminal 2 is 0V.
> Possible cause : Open circuit in ground line or faulty PCM

COMPONENT INSPECTION

1. CKPS air gap Inspection
   - (1) Remove CKPS and calculate air gap between sensor and tooth wheel.
   - (2) Measure distance from hosing to tooth on tooth wheel.(Measurement "A")
   - (3) Measure from mounting surface on sensor to sensor tip.(Measurement "B")
   - (4) Subtract "B" from "A" = air gap



   - (5) Are air gap within specification?

YES

Go to "Check PCM" as below.

NO

Fauity air gap.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure

2. Check PCM

The purpose of checking PCM is to determine whether there is any malfunction of PCM .

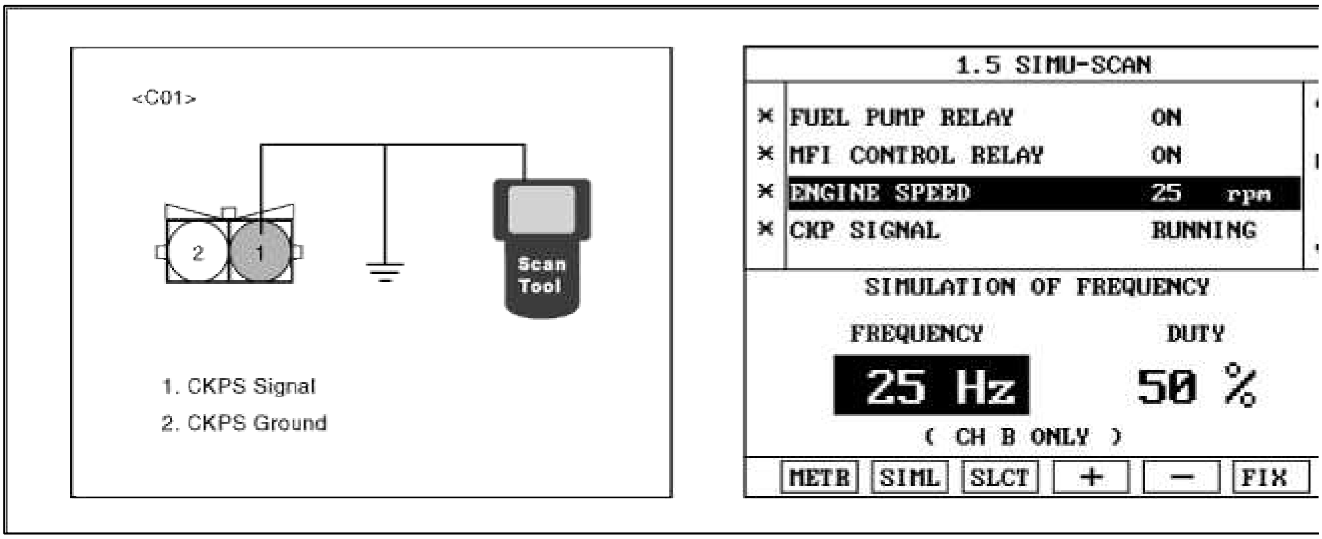
(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.

(4) Simulate frequency at terminal 1 of CKP sensor signal connector.

(5) Verify CKPS frequency to change while raising or lowering simulation frequency with scan tool within 25 Hz



1.5 SIMU-SCAN

× FUEL PUMP RELAY ON
× MFI CONTROL RELAY ON
× ENGINE SPEED 25 rpm
× CKP SIGNAL RUNNING

SIMULATION OF FREQUENCY

FREQUENCY 25 Hz
DUTY 50 %
(CH B ONLY)

(6) Is injector operating sound heard in propotion to simulation frequency ?

YES

Check CKPS for contamination, deterioration, or damage. Clean CKPS with suitable cleaner as necessary air dry before reinstalling. If problem still exists, Substitute with a known-good CKPS and check for proper operation.
If the problem is corrected, replace CKPS and then go to "Verification of vehicle Repair" procedure

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

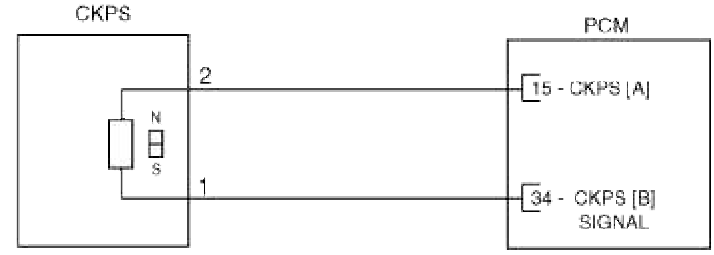
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

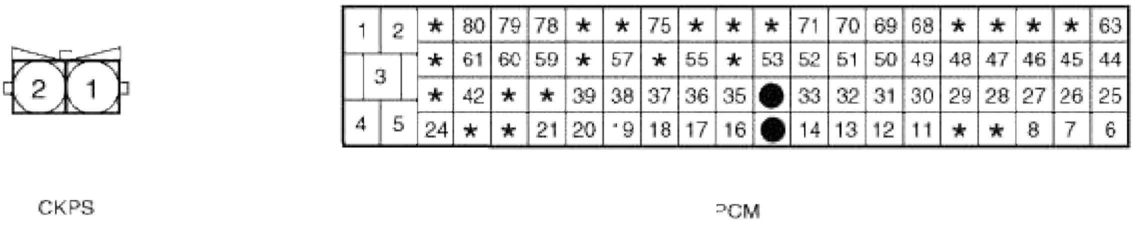
[CIRCUIT DIAGRAM]


CKPS
PCM
2
1
N
S
15 - CKPS [A]
34 - CKPS [B] SIGNAL

[CONNECTION INFORMATION]

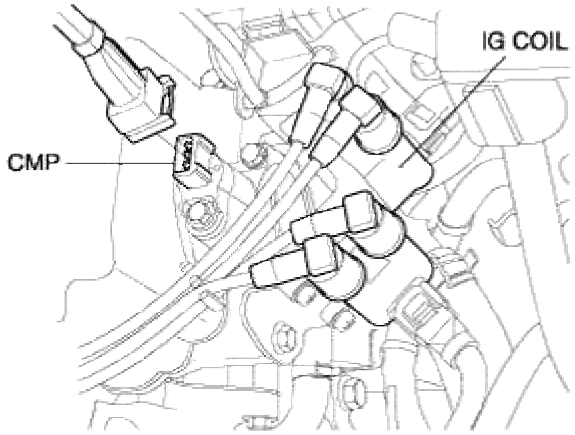
Terminal	Connected to	Function
2	PCM Terminal 15	CKPS [A] Signal
1	PCM Terminal 34	CKPS [B] signal

[HARNESS CONNECTORS]


2 1
CKPS
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 ● 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 ● 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P0340

COMPONENT LOCATION



GENERAL DESCTIPTION

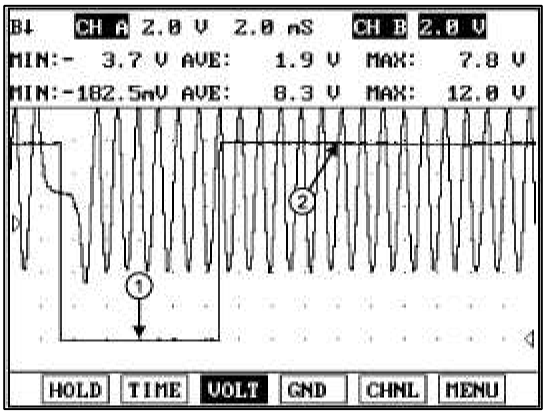
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check	● Open in signal circuit ● Open in battery and ground circuit ● Short to ground in signal circuit ● Short to battery in signal circuit ● Faulty CMPS ● Faulty PCM
Threshold value	● Signal high and no phase edge : 12 times ● Signal low and no phase edge : 12 times ● Irregular phase edge : 12times	
Enable Conditions	● Sensor signal requested	
Diagnostic Time		
Fail Safe	● The normal serial fuel injection starts with crankshaft sensor signal. ● Ignition timing is retarded.	

MONITOR DTC STATUS

1. Engine "ON"
2. Monitor wave form at the terminal 2 of CMPS.



```
B↓   CH A 2.0 V  2.0 mS    CH B 2.0 V
MIN:-  3.7 V AVE:    1.9 V  MAX:   7.8 V
MIN:-182.5mV AVE:    8.3 V  MAX:  12.0 V
```

3. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

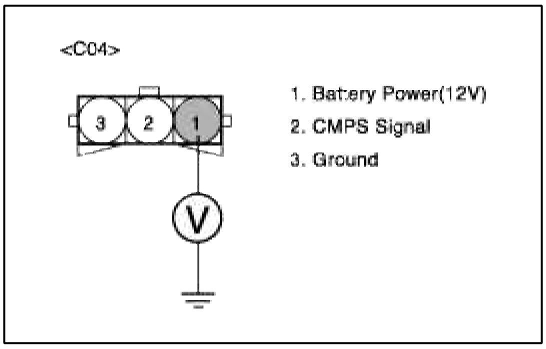
NO

Go to ""Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"

2. Disconnect CMP sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.


<C04>
3
2
1
V
1. Battery Power(12V)
2. CMPS Signal
3. Ground

5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

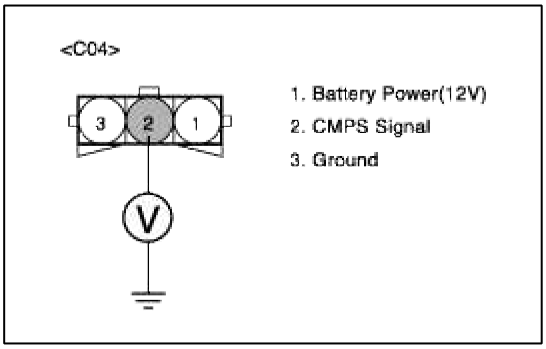
NO

Open or short circuit to chassis ground between CMPS harness connector and battery power circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure

> **NOTE**
>
> In case,when CMPS connector is disconnected,the voltage at terminal 1 is 0V.
> Possible cause : Open or short circuit between I/P-J/BOX fuse(15A) and CMPS terminal 1.

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
   - (1) Ignition "OFF"
   - (2) Disconnect CMP sensor connector.
   - (3) Ignition "ON" & Engine "OFF"
   - (4) Measure voltage between terminal 2 of sensor harness connector and chassis ground.


<C04>
3
2
1
V
1. Battery Power(12V)
2. CMPS Signal
3. Ground

(5) Is measure voltage within Specification?

YES

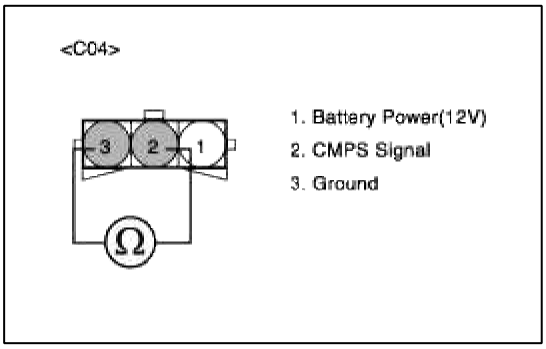
Go to "Check for short to power in harness " as below.

NO

Open or short circuit between CMPS harnece connector and PCM harness connector.
Fault PCM
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

> **NOTE**
>
> In case,when CMPS connector is disconnected,the voltage at terminal 2 is 0V.
> Possible cause : Open signal line or faulty PCM

2. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect CMP sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 2 and 3 of sensor harness connector.



(5) Is measure resistance within Specification?

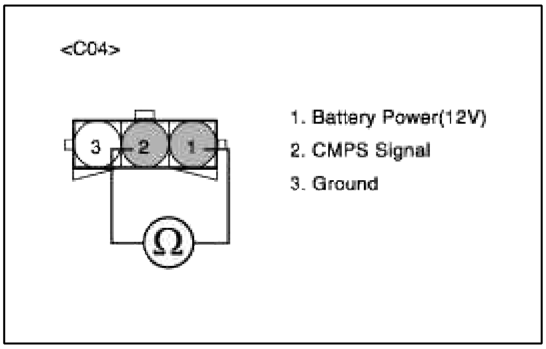
YES

Go to "Ground Circuit Inspection" procedure.

NO

Short circuit to ground between CMPS harness connector and PCM harness connector.
Short circuit between CMPS signal circuit and ground circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

3. Check for short to power in harness
    (1) Ignition "OFF"
    (2) Disconnect CMP sensor connector and PCM connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure resistance between terminal 1 and 2 of sensor harness connector.



(5) Is measure resistance within Specification?

YES

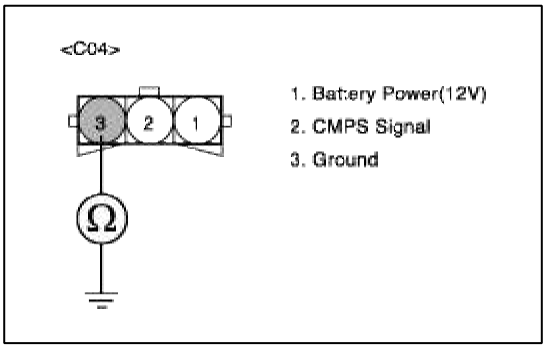
Go to "Ground Circuit Inspection" procedure.

NO

Short circuit between CMPS signal circuit and power circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect CMP sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 3 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between Fuel sender harness connector and chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

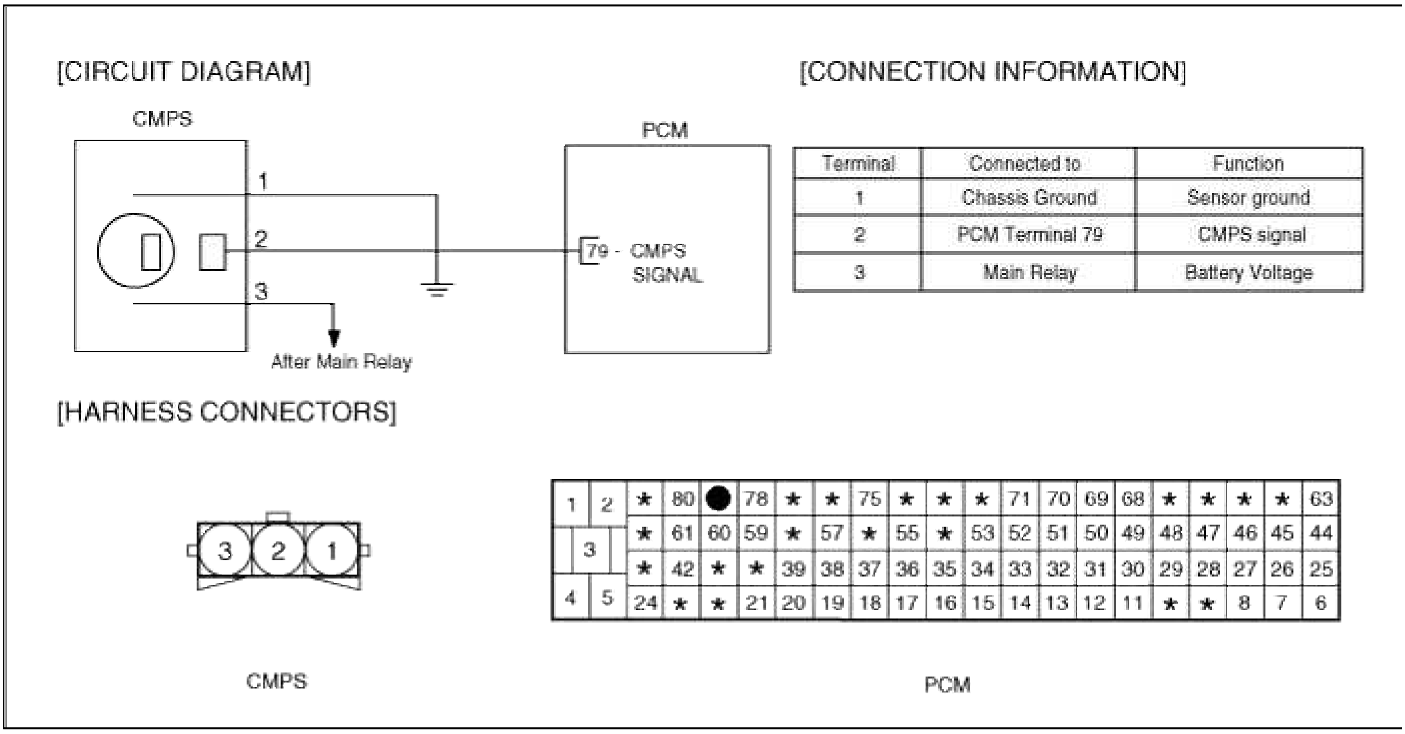
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
CMPS
1
2
3
After Main Relay
PCM
79 - CMPS SIGNAL
[HARNESS CONNECTORS]
3
2
1
CMPS
PCM

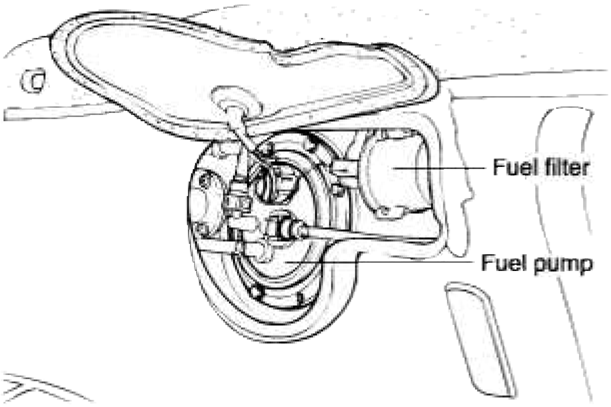
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Chassis Ground	Sensor ground
2	PCM Terminal 79	CMPS signal
3	Main Relay	Battery Voltage

1	2	★	80	●	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0461

COMPONENT LOCATION


Fuel filter
Fuel pump

GENERAL DESCTIPTION

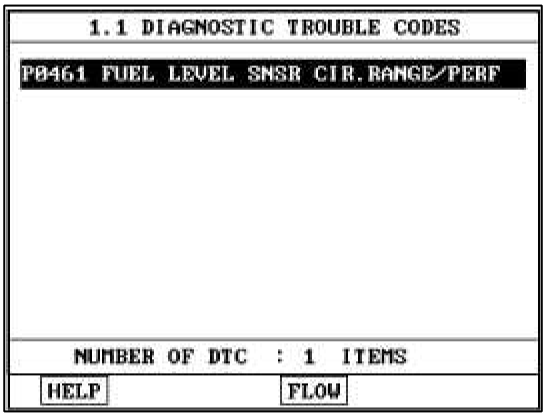
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Rationality check	● Poor connections ● Faulty TPS ● Faulty PCM ● Open or short in battery circuit ● Dirty air cleaner ● Air leak in intake system ● Contaminated, deterriorated or damaged TPS
Threshold value	● Consumed fuel (model) - consumed fuel (actual) > 10 L or < -10 L	
Enable Conditions	● Fuel level signal is valid ● Consumed fuel (model) > 15 L ● Fuel level change at instant < 0.4 L ● 15 sec after ignition on	
Diagnostic Time	● 5 sec	
Fail Safe	● Throttle position value is determined by function of engine speed, MAP sensor and idle duty.	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor DTC(Diagnostics Trouble Code) on the scantool.



1.1 DIAGNOSTIC TROUBLE CODES

P0461 FUEL LEVEL SNSR CIR.RANGE/PERF

NUMBER OF DTC : 1 ITEMS

Service standard
FULL : 0.3 ~ 0.9 V
EMPTY : 4.5 ~ 5.2 V

4. Is the same DTC displayed again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensors and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

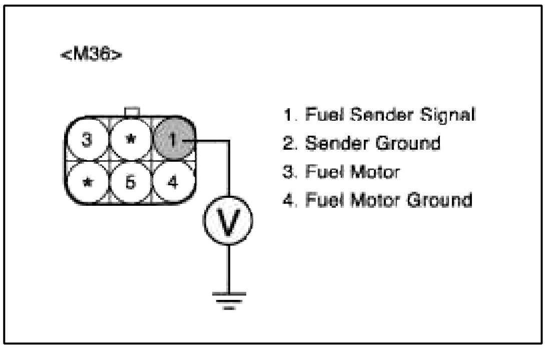
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect Fuel sender connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 1 of sensor harness connector and chassis ground.


<M36>
3
*
1
*
5
4
V
1. Fuel Sender Signal
2. Sender Ground
3. Fuel Motor
4. Fuel Motor Ground

   (5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness" as below.

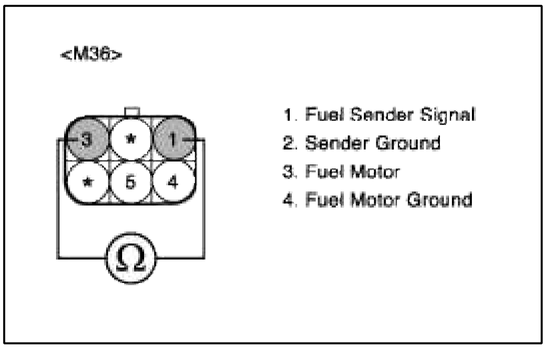
NO

Open circuit or short circuit to chassis ground between Fuel sender harness connector and PCM connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the Fuel sender connector is disconnected,the voltage of Fuel sender terminal 3 is 0 V.
> Possible cause: Open or short between terminal 21 of PCM and terminal 3 of Fuel sender.

2. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect Fuel sender connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 and 3 of Fuel sender harness connector.


<M36>
3
*
1
*
5
4
Ω
1. Fuel Sender Signal
2. Sender Ground
3. Fuel Motor
4. Fuel Motor Ground

(5) Is measure resistance within Specification?

YES

Go to "Component Inspection" procedure.

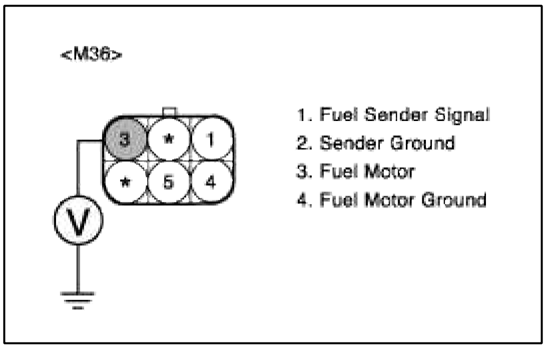
NO

Short circuit to ground between Fuel sender harness connector and sender signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the Fuel sender connector is disconnected,the voltage of Fuel sender terminal 3 is 0 V.
>
> Possible cause: Open or short between terminal 21 of PCM and terminal 3 of Fuel sender.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect Fuel sender connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 3 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between Fuel sender harness connector and chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

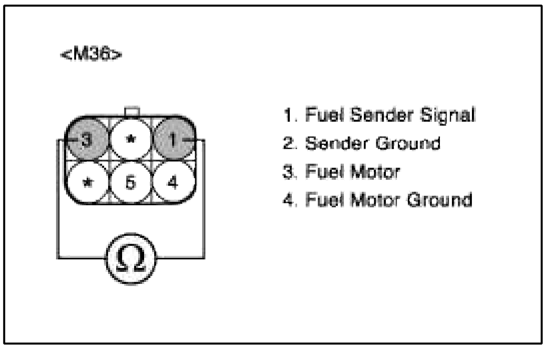
> **NOTE**
>
> In case,when the Fuel sender connector is disconnected,the voltage of Fuel sender terminal 3 is infinite.
>
> Possible cause: Open circuit between terminal 3 of Fuel sender and chassis ground.

COMPONENT INSPECTION

1. Check Fuel sender
   (1) Ignition "OFF"

   (2) Disconnect Fuel sender connector.

   (3) Measure resistance between terminal 1 and 3 of sensor connector(To sensor side)



   (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Fuel sender and check for proper operation. If the problem is corrected, replace Fuel sender and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

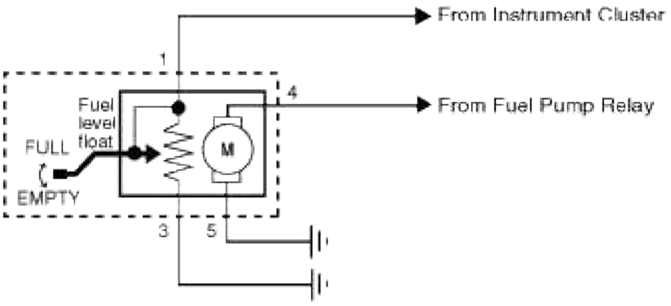
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

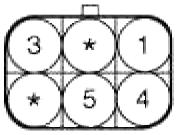
[CIRCUIT DIAGRAM]


From Instrument Cluster
1
4
From Fuel Pump Relay
Fuel level float
FULL
EMPTY
M
3
5

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	From Instrument Cluster	Sender Signal
2	*	*
3	Chassis Ground	Sender Ground
1	From Fuel Pump Relay	Battery Voltage
5	Chassis Ground	Fuel Motor Ground
6	*	*

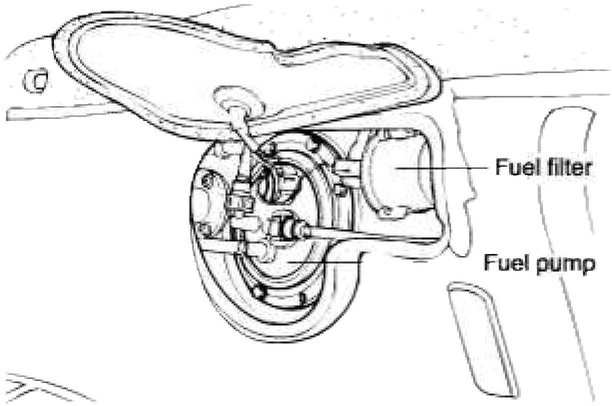
[HARNESS CONNECTORS]



Fuel Sensor & Fuel Pump Motor

Fuel System > Troubleshooting > P0462

COMPONENT LOCATION


Fuel filter
Fuel pump

GENERAL DESCTIPTION

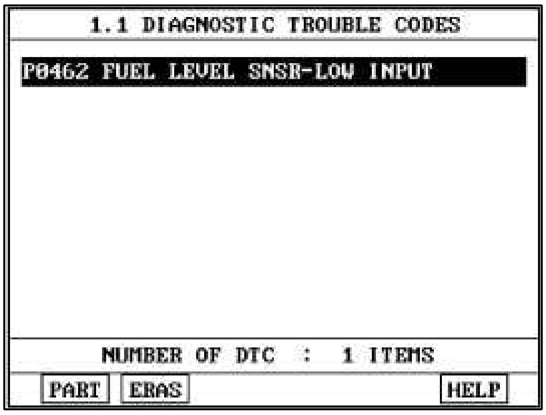
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check, low	● Short to ground in signal circuit (pin 21 to ground) ● Faulty Fuel sender ● Faulty PCM
Threshold value	● Voltage < 0.1V	
Enable Conditions	● Shorted circuit	
Diagnostic Time	● 5 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor DTC(Diagnostics Trouble Code) on the scantool.



1.1 DIAGNOSTIC TROUBLE CODES

P0462 FUEL LEVEL SNSR-LOW INPUT

NUMBER OF DTC : 1 ITEMS

Service standard
FULL : 0.2 ~ 0.7 V
EMPTY : 4.5 ~ 5.2 V

4. Is the same DTC displayed again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensors and/or PCM's connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

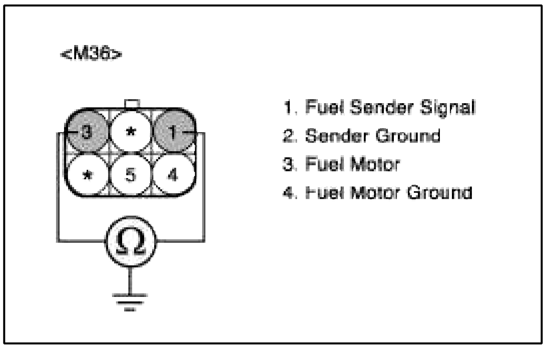
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect Fuel sender connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 and 3 of Fuel sender harness connector.
   (5) Measure resistance between terminal 1 and 3 of Fuel sender harness connector and chassis ground.


<M36>
3
*
1
*
5
4
Ω
1. Fuel Sender Signal
2. Sender Ground
3. Fuel Motor
4. Fuel Motor Ground

   (6) Is measure resistance within Specification?

YES

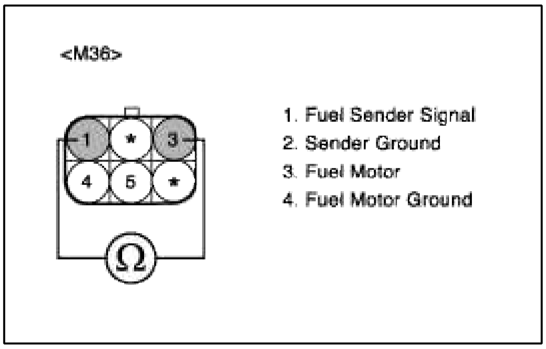
Go to "Component Inspection" procedure.

NO

Short circuit to ground between Fuel sender harness connector and sender signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check Fuel sender
   (1) Ignition "OFF"
   (2) Disconnect Fuel sender connector.
   (3) Measure resistance between terminal 1 and 3 of sensor connector(To sensor side)


<M36>
1
*
3
4
5
*
Ω
1. Fuel Sender Signal
2. Sender Ground
3. Fuel Motor
4. Fuel Motor Ground

   (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Fuel sender and check for proper operation. If the problem is corrected, replace Fuel sender and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.

3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

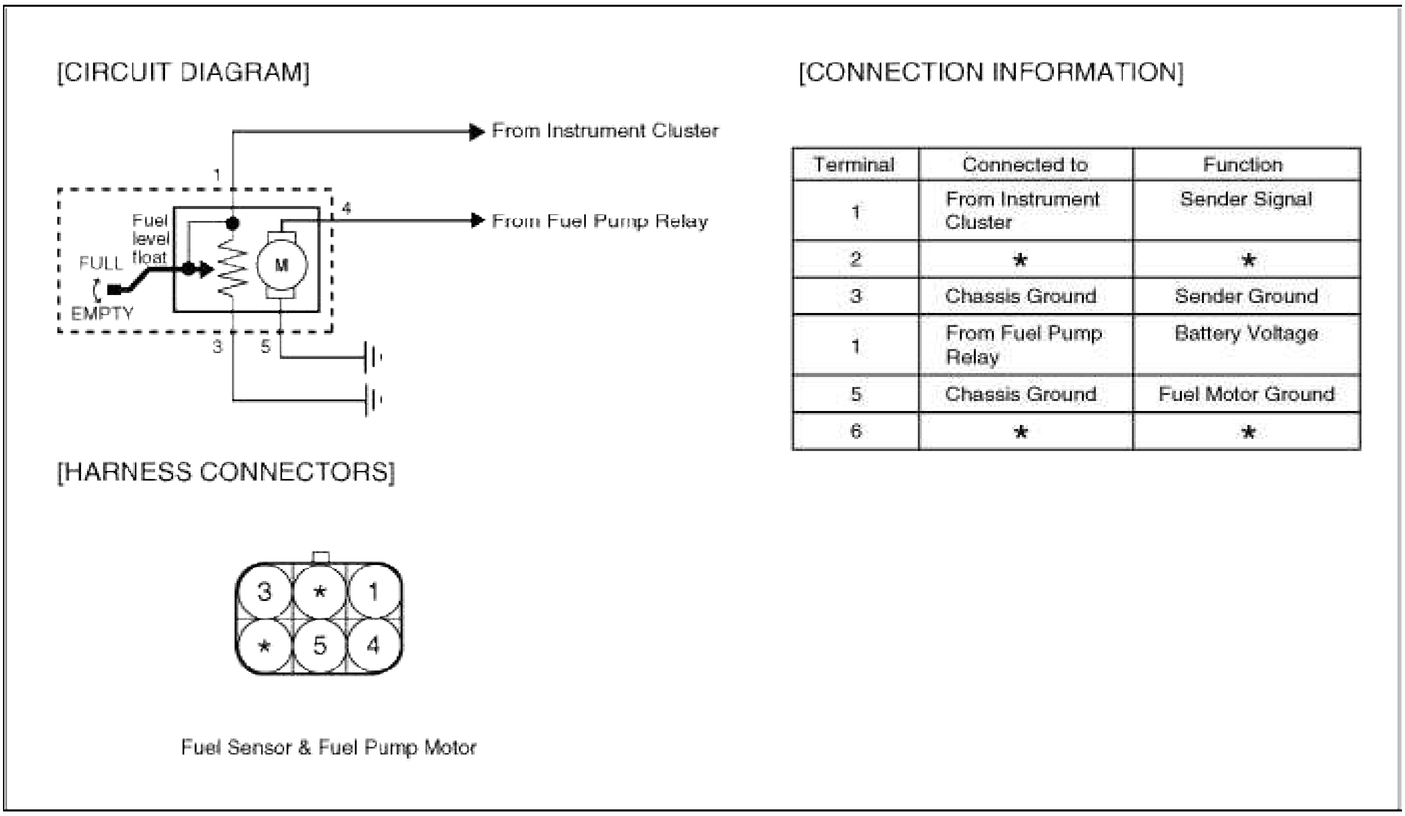
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

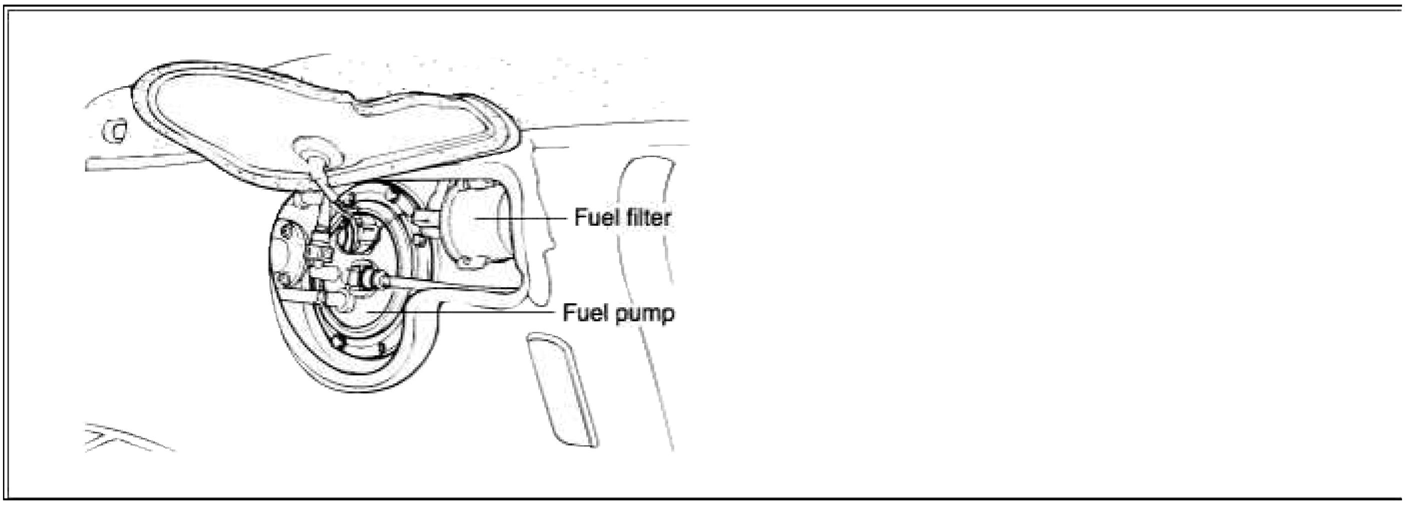
SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
From Instrument Cluster
1
4
From Fuel Pump Relay
Fuel level float
FULL
EMPTY
M
3
5
[HARNESS CONNECTORS]
3
*
1
*
5
4
Fuel Sensor & Fuel Pump Motor
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	From Instrument Cluster	Sender Signal
2	*	*
3	Chassis Ground	Sender Ground
1	From Fuel Pump Relay	Battery Voltage
5	Chassis Ground	Fuel Motor Ground
6	*	*

Fuel System > Troubleshooting > P0463

COMPONENT LOCATION


Fuel filter
Fuel pump

GENERAL DESCTIPTION

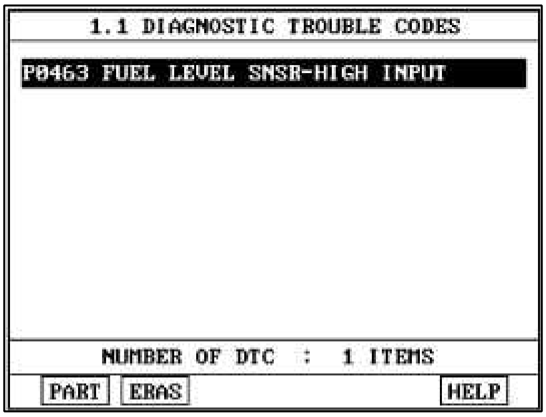
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
DTC Strategy	● Signal check high	● Open in signal circuit ● Short to battery in signal circuit ● Open in ground circuit ● Faulty Fuel sender ● Faulty PCM
Threshold value	● Voltage > 4.9V	
Enable Conditions	● Open circuit	
Diagnostic Time	● 5 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor DTC(Diagnostics Trouble Code) on the scantool.



1.1 DIAGNOSTIC TROUBLE CODES

P0463 FUEL LEVEL SNSR-HIGH INPUT

NUMBER OF DTC : 1 ITEMS

Service standard
FULL : 0.2 ~ 0.7 V
EMPTY : 4.5 ~ 5.2 V

4. Is the same DTC displayed again?

YES

Go to "W/Harness Inspection" procedure.

NO

Fault is intermittent caused by poor contact in the sensors and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

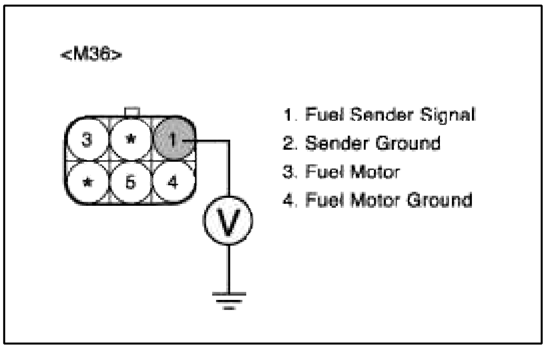
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
    (1) Ignition "OFF"
    (2) Disconnect Fuel sender connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure voltage between terminal 1 of sensor harness connector and chassis ground.


<M36>
3
*
1
*
5
4
V
1. Fuel Sender Signal
2. Sender Ground
3. Fuel Motor
4. Fuel Motor Ground

    (5) Is measure voltage within Specification?

YES

Go to "Ground Circuit Inspection" procedure

NO

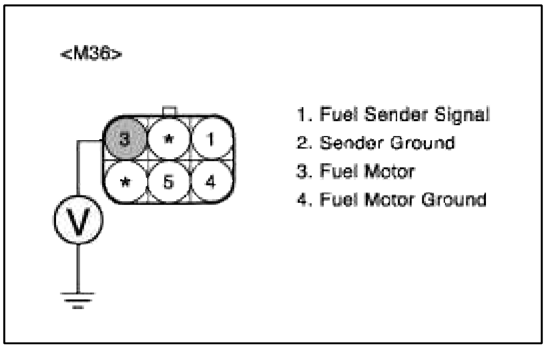
Open circuit or short circuit to chassis ground between Fuel sender harness connector and PCM connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the Fuel sender connector is disconnected,the voltage of Fuel sender terminal 1 is 0 V.
>
> Possible cause: Open or short between terminal 21 of PCM and terminal 1 of Fuel sender.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect Fuel sender connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 3 of sensor harness connector and chassis ground.


<M36>
3
*
1
*
5
4
V
1. Fuel Sender Signal
2. Sender Ground
3. Fuel Motor
4. Fuel Motor Ground

5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

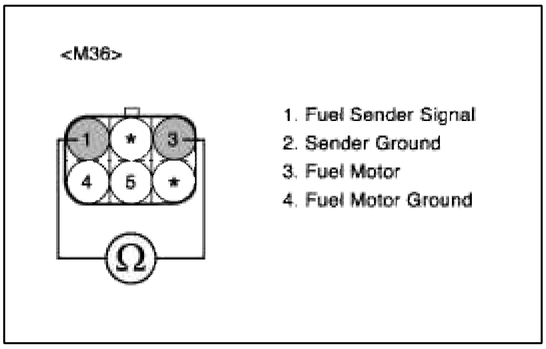
NO

Open circuit between Fuel sender harness connector and chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the Fuel sender connector is disconnected,the voltage of Fuel sender terminal 3 is infinite.
> Possible cause: Open circuit between terminal 3 of Fuel sender and chassis ground.

COMPONENT INSPECTION

1. Check Fuel sender
   (1) Ignition "OFF"
   (2) Disconnect Fuel sender connector.
   (3) Measure resistance between terminal 1 and 3 of sensor connector(To sensor side)



   (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good Fuel sender and check for proper operation. If the problem is corrected, replace Fuel sender and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

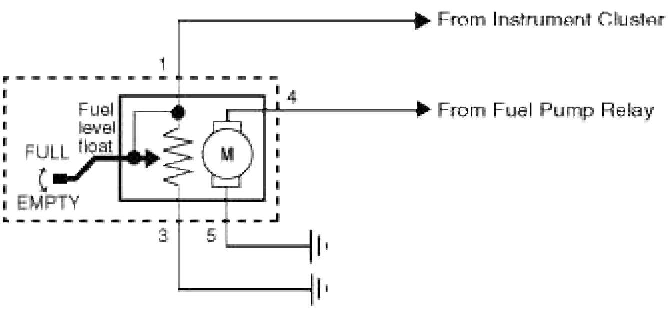
Go to the applicable troubleshooting procedure.

NO

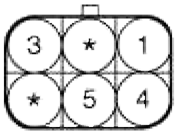
System is performing to specification at this time.

SCHEMATIC DIAGRAM

[CIRCUIT DIAGRAM]


From Instrument Cluster
From Fuel Pump Relay
1
4
Fuel level float
FULL
EMPTY
M
3
5

[HARNESS CONNECTORS]



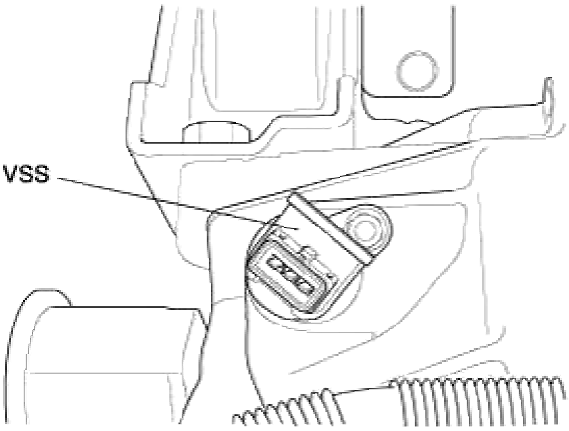
Fuel Sensor & Fuel Pump Motor

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	From Instrument Cluster	Sender Signal
2	*	*
3	Chassis Ground	Sender Ground
1	From Fuel Pump Relay	Battery Voltage
5	Chassis Ground	Fuel Motor Ground
6	*	*

Fuel System > Troubleshooting > P0501

COMPONENT LOCATION



GENERAL DESCTIPTION

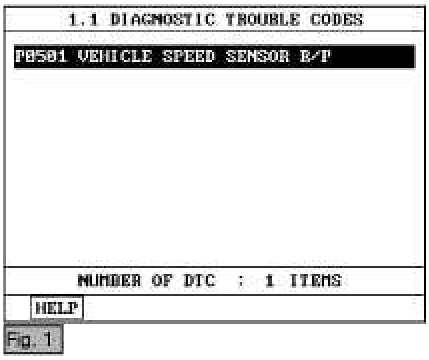
DTC DESCRIPTION

DTC DETECTING CONDITION

Item		Detecting Condition	Possible cause
Monitoring Strategy		● Rationality check	● Open in signal circuit ● Open in battery and ground circuit ● Short to ground in signal circuit ● Short to battery in signal circuit ● Faulty VSS ● Faulty PCM
case1	Threshold value	● No vehicle speed signal(during injection) : < 3.75kph(2.330142 mile)	
	Enable Conditions	● Engine speed > 3000 rpm ● Engine load > 50 % ● Coolant temperature > 65 degC(149 °F)	
case2	Threshold value	● No vehicle speed signal (during fuel cut-off) < 5 kph(3.106856 mile)	
	Enable Conditions	● Engine speed 1520-4000 rpm ● Coolant temperature > 65 degC(149 °F)	
Diagnostic Time		● 20 sec	
Fail Safe		● None	

MONITOR DTC STATUS

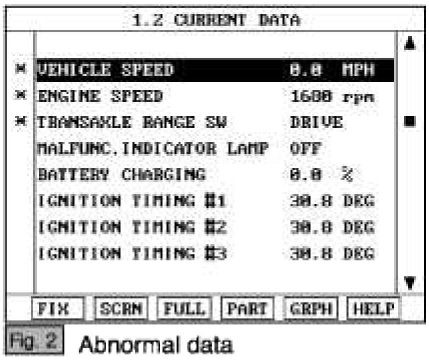
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "VSS signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0501 VEHICLE SPEED SENSOR R/P

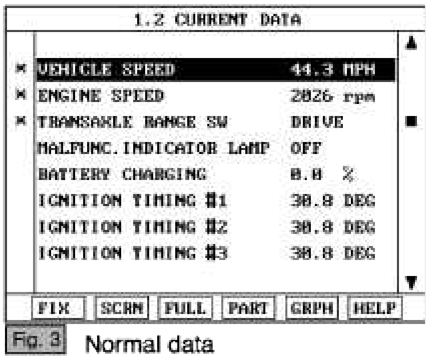
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* VEHICLE SPEED              0.0  MPH
* ENGINE SPEED               1600 rpm
* TRANSAXLE RANGE SW         DRIVE
  MALFUNC.INDICATOR LAMP     OFF
  BATTERY CHARGING           0.0  %
  IGNITION TIMING #1         30.0 DEG
  IGNITION TIMING #2         30.0 DEG
  IGNITION TIMING #3         30.0 DEG
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* VEHICLE SPEED              44.3 MPH
* ENGINE SPEED               2026 rpm
* TRANSAXLE RANGE SW         DRIVE
  MALFUNC.INDICATOR LAMP     OFF
  BATTERY CHARGING           0.0  %
  IGNITION TIMING #1         30.0 DEG
  IGNITION TIMING #2         30.0 DEG
  IGNITION TIMING #3         30.0 DEG
```

Fig. 3 Normal data

Service standard
Approximately 40 Km/h

NOTE

The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" proceduredure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

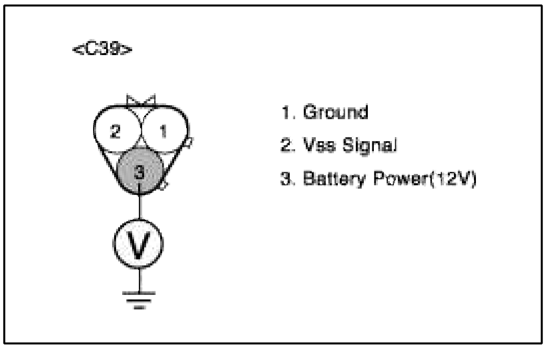
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect VSS sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

Open circuit or short circuit to chassis ground between VSS harness connector and battery power circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the connector of VSS is disconnected, the voltage of terminal 3 is 1V.
> Possible cause:Open circuit or short circuit after I/P-J/BOX fuse(10A)

SIGNAL CIRCUIT INSPECTION

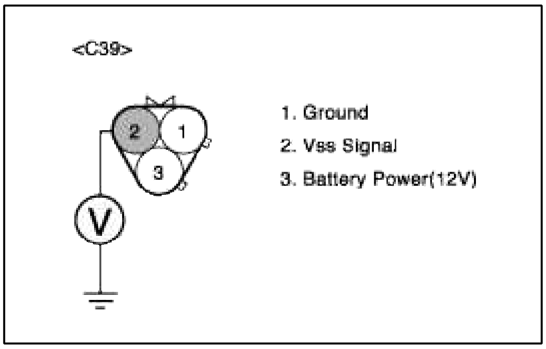
1. Check for open in harness

   (1) Ignition "OFF"

   (2) Disconnect VSS sensor connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 2 of sensor harness connector and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

Open or short circuit between VSS harnece connector and PCM harness connector.
Faulty PCM
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

1. In case,when the connector of VSS is disconnected, the voltage of terminal 2 is 0V.
   Possible cause: If the terminal 2 voltage of VSS is 0V, the possible cause is likely to be open or bad PCM.
2. The voltage of terminal 2 is about 6.5~7.5V when the VSS connector is disconnected.

2. Check for short to ground in harness

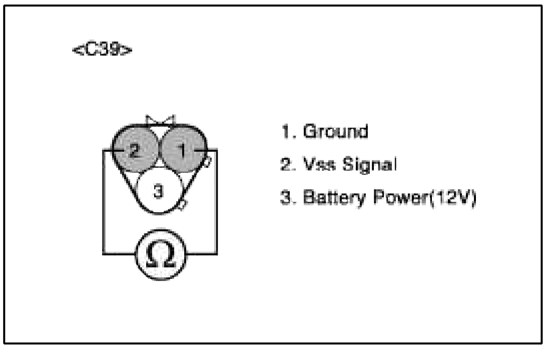
   When the voltage of VSS terminal 2 is 0V, the inspection of short circuit is recommended to find open or short circuit of signal line.

   (1) Ignition "OFF"

   (2) Disconnect VSS sensor connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure resistance between terminal 1 and 2 of sensor harness connector.



(5) Is measure resistance within Specification?

YES

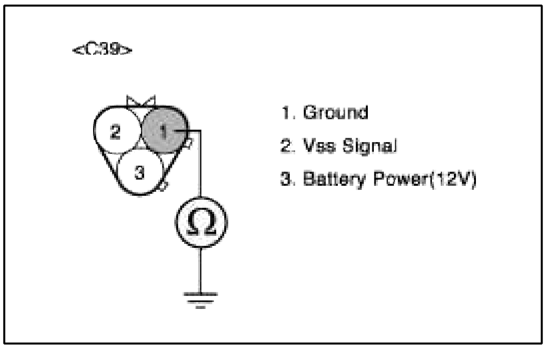
Go to "Ground Circuit Inspection" procedure.

NO

short circuit to chassis ground between VSS harness connector and PCM harness connector.
short circuit between VSS signal circuit and ground circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect VSS sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between VSS harnece connector and Chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

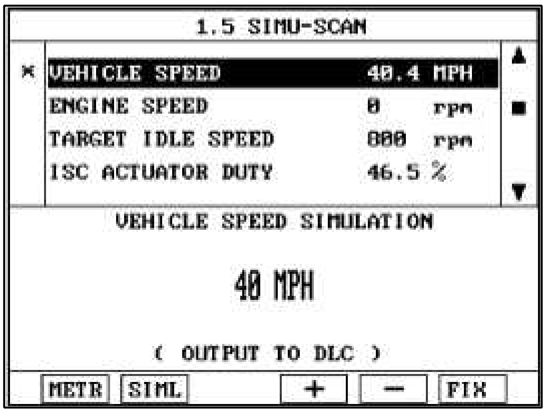
1. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of PCM .

(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.



```
1.5 SIMU-SCAN
* VEHICLE SPEED          40.4 MPH
  ENGINE SPEED           0    rpm
  TARGET IDLE SPEED      800  rpm
  ISC ACTUATOR DUTY      46.5 %
VEHICLE SPEED SIMULATION
40 MPH
( OUTPUT TO DLC )
```

(4) Is VSS sensor signal value changed according to simulation voltage ?

YES

Check VSS for contamination, deterioration, or damage. Clean VSS with suitable cleaner as necessary and let air dry before reinstalling. If problem still exists, Substitute with a known-good VSS and check for proper operation.

If the problem is corrected, replace VSS and then go to "Verification of vehicle Repair" procedure

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

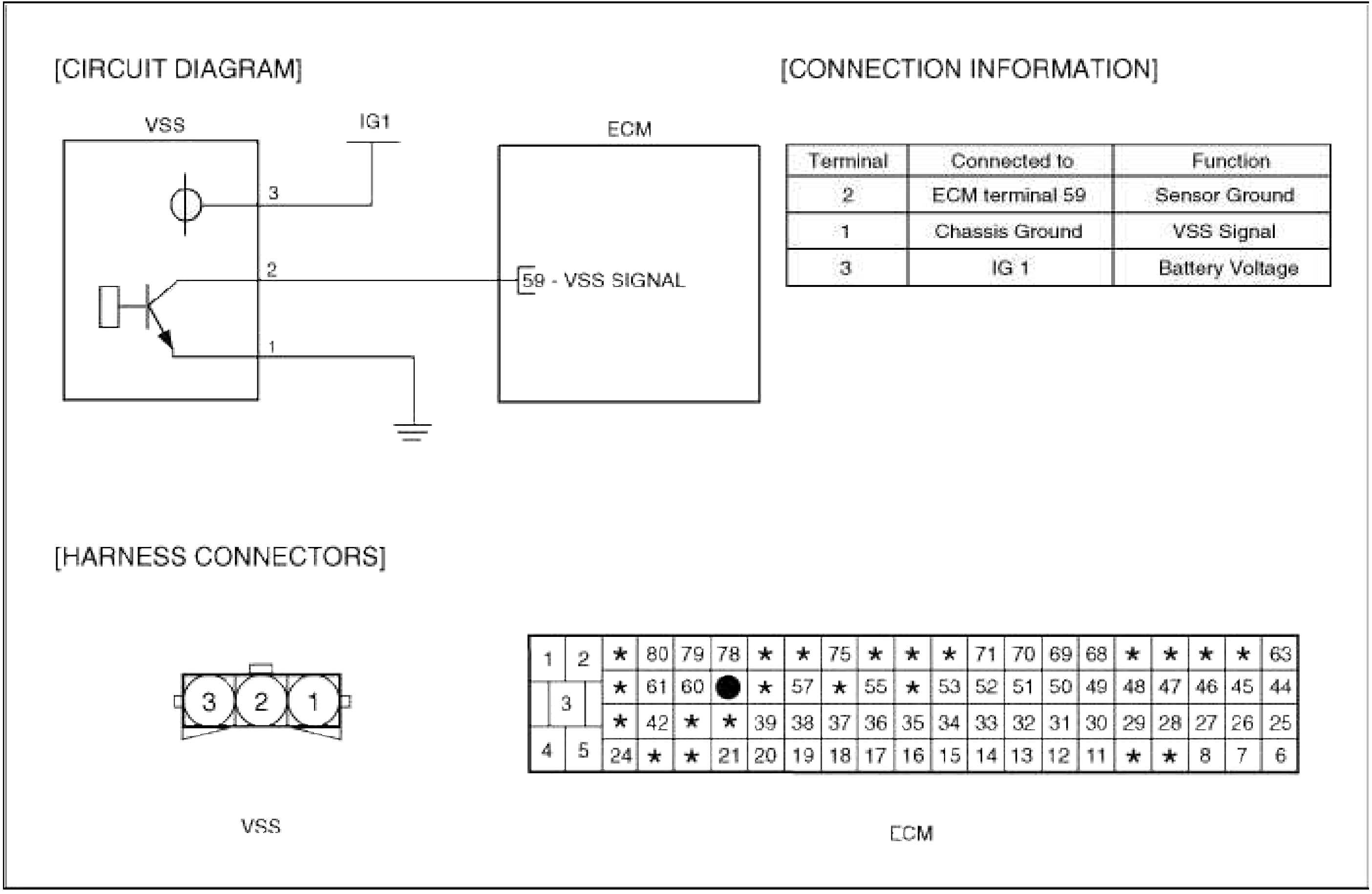
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

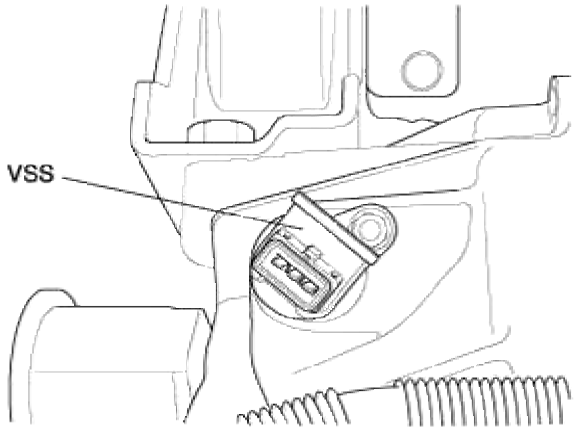
SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
VSS
IG1
ECM
3
2
1
59 - VSS SIGNAL
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
3 2 1
VSS
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 ● ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
ECM

Terminal	Connected to	Function
2	ECM terminal 59	Sensor Ground
1	Chassis Ground	VSS Signal
3	IG 1	Battery Voltage

Fuel System > Troubleshooting > P0502

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

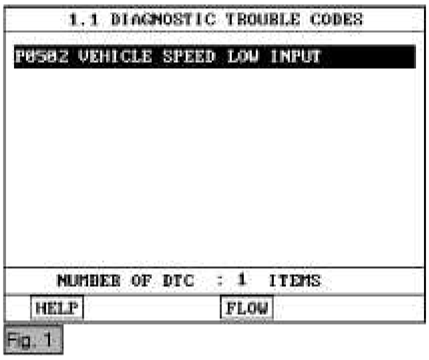
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check	● Open in signal circuit ● Open in battery and ground circuit ● Short to ground in signal circuit ● Short to battery in signal circuit ● Faulty VSS ● Faulty PCM
Threshold value	● Constant vehicle speed > 20 sec	
Enable Conditions	● Vehicle speed > 0 kph(0 mile)	
Diagnostic Time	● 20 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

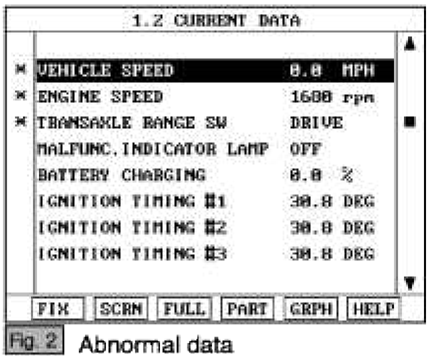
3. Monitor the "VSS signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0502 VEHICLE SPEED LOW INPUT

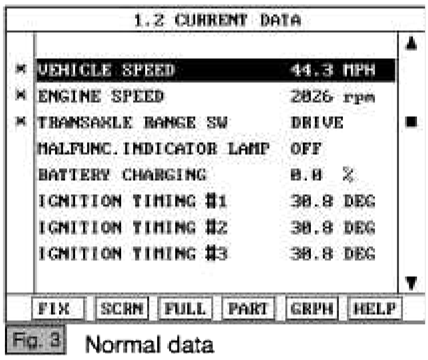
NUMBER OF DTC  : 1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* VEHICLE SPEED            0.0  MPH
* ENGINE SPEED             1600 rpm
* TRANSAXLE RANGE SW       DRIVE
  MALFUNC.INDICATOR LAMP   OFF
  BATTERY CHARGING         0.0  %
  IGNITION TIMING #1       30.0 DEG
  IGNITION TIMING #2       30.0 DEG
  IGNITION TIMING #3       30.0 DEG
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* VEHICLE SPEED            44.3 MPH
* ENGINE SPEED             2026 rpm
* TRANSAXLE RANGE SW       DRIVE
  MALFUNC.INDICATOR LAMP   OFF
  BATTERY CHARGING         0.0  %
  IGNITION TIMING #1       30.0 DEG
  IGNITION TIMING #2       30.0 DEG
  IGNITION TIMING #3       30.0 DEG
```

Fig. 3 Normal data

Service standard
Approximately 40 Km/h

> **NOTE**
>
> The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" proceduredure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

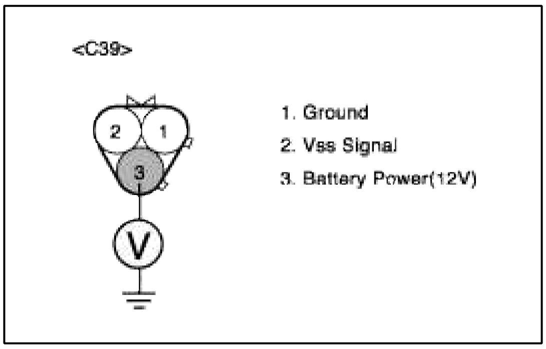
NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect VSS sensor connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 3 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

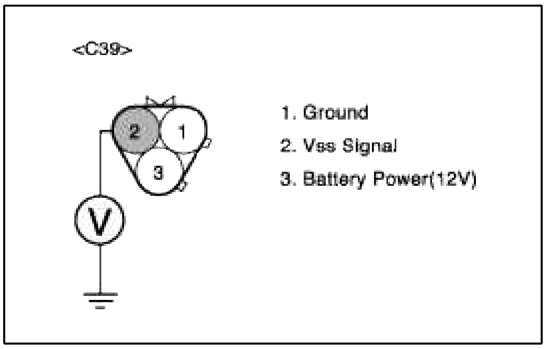
NO

Open circuit or short circuit to chassis ground between VSS harness connector and battery power circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when the connector of VSS is disconnected, the voltage of terminal 3 is 1V.
> Possible cause:Open circuit or short circuit after I/P-J/BOX fuse(10A)

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect VSS sensor connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector and chassis ground.



(5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

Open or short circuit between VSS harnece connector and PCM harness connector.
Faulty PCM
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> 1. In case,when the connector of VSS is disconnected, the voltage of terminal 2 is 0V.
>   Possible cause: If the terminal 2 voltage of VSS is 0V, the possible cause is likely to be open or bad PCM.
> 2. The voltage of terminal 2 is about 6.5~7.5V when the VSS connector is disconnected.

2. Check for short to ground in harness

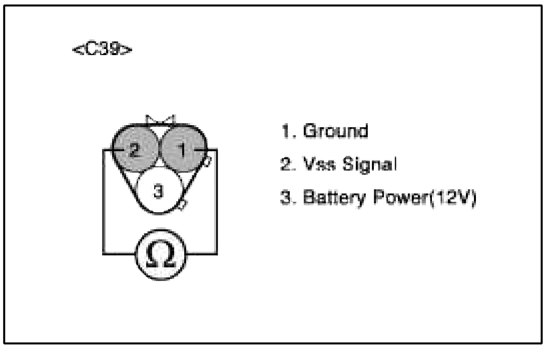
When the voltage of VSS terminal 2 is 0V, the inspection of short circuit is recommended to find open or short circuit of signal line.

(1) Ignition "OFF"

(2) Disconnect VSS sensor connector and PCM connector.

(3) Ignition "ON" & Engine "OFF"

(4) Measure resistance between terminal 1 and 2 of sensor harness connector.



(5) Is measure resistance within Specification?

YES

Go to "Ground Circuit Inspection" procedure.

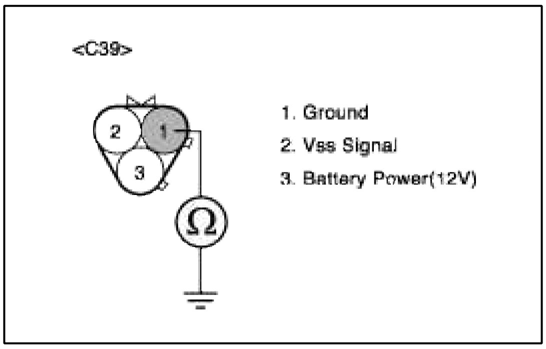
NO

short circuit to chassis ground between VSS harness connector and PCM harness connector.
short circuit between VSS signal circuit and ground circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect VSS sensor connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage or resistance between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between VSS harnece connector and Chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

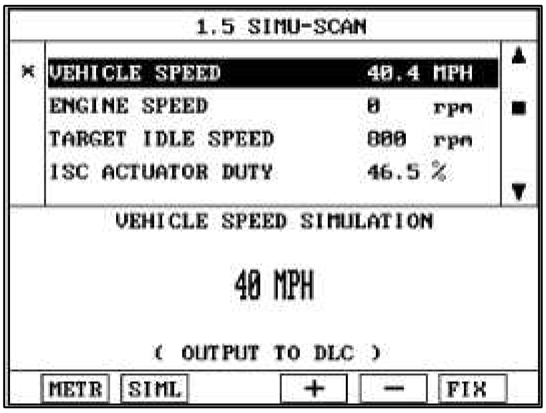
1. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of PCM .

(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.



```
             1.5 SIMU-SCAN
* VEHICLE SPEED            40.4 MPH
  ENGINE SPEED             0    rpm
  TARGET IDLE SPEED        800  rpm
  ISC ACTUATOR DUTY        46.5 %
       VEHICLE SPEED SIMULATION

               40 MPH

          ( OUTPUT TO DLC )
```

(4) Is VSS sensor signal value changed according to simulation voltage ?

YES

Check VSS for contamination, deterioration, or damage. Clean VSS with suitable cleaner as necessary and let air dry before reinstalling. If problem still exists, Substitute with a known-good VSS and check for proper operation.
If the problem is corrected, replace VSS and then go to "Verification of vehicle Repair" procedure

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

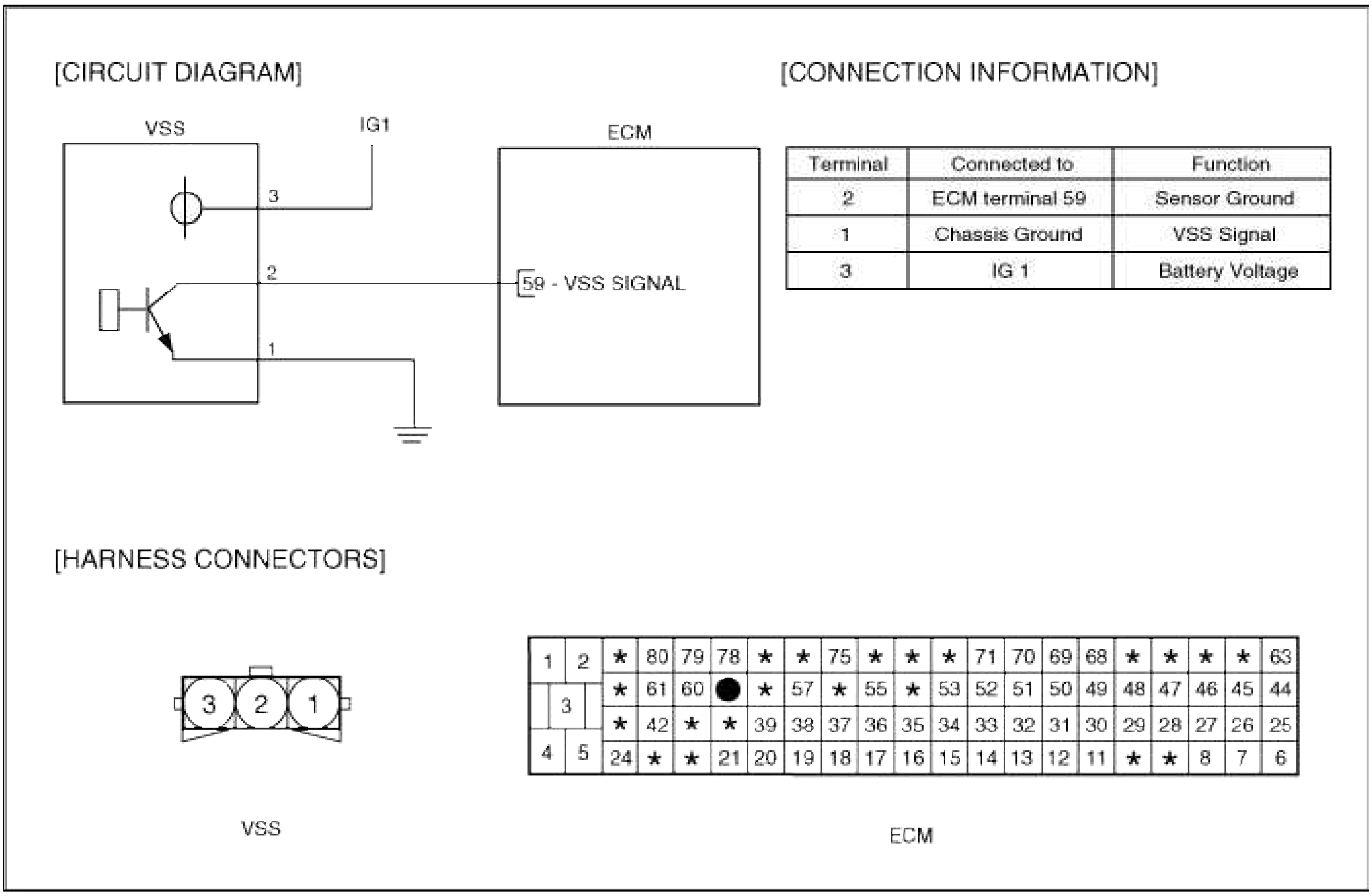
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
VSS
IG1
ECM
3
2
1
59 - VSS SIGNAL
[HARNESS CONNECTORS]
3
2
1
VSS
ECM

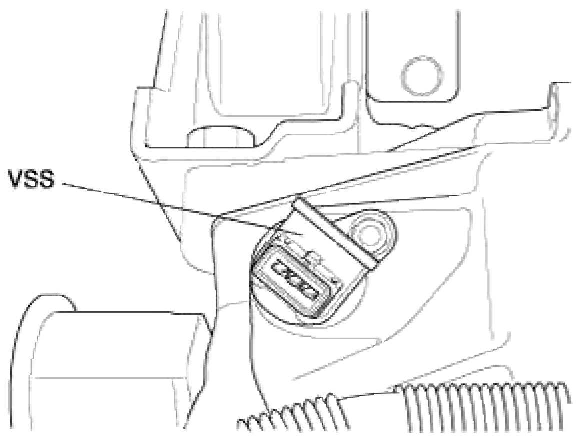
[CONNECTION INFORMATION]

Terminal	Connected to	Function
2	ECM terminal 59	Sensor Ground
1	Chassis Ground	VSS Signal
3	IG 1	Battery Voltage

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
	3	★	61	60	●	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0503

COMPONENT LOCATION



GENERAL DESCTIPTION

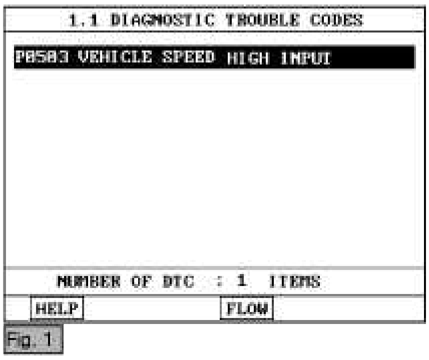
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check	● Open in signal circuit ● Open in battery and ground circuit ● Short to ground in signal circuit ● Short to battery in signal circuit ● Faulty VSS ● Faulty PCM
Threshold value	● Vehicle speed > 275 kph(170.877078 mile)	
Enable Conditions		
Diagnostic Time		
Fail Safe	● None	

MONITOR DTC STATUS

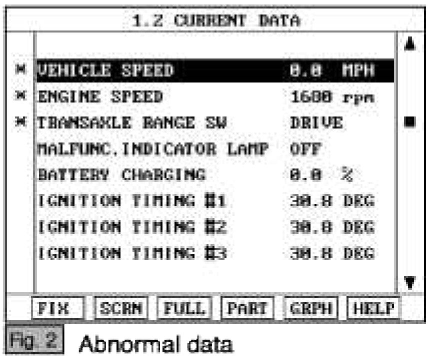
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "VSS signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0503 VEHICLE SPEED HIGH INPUT

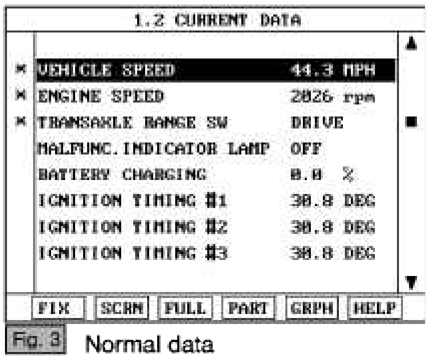
    NUMBER OF DTC  : 1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* VEHICLE SPEED            0.0  MPH
* ENGINE SPEED             1600 rpm
* TRANSAXLE RANGE SW       DRIVE
  MALFUNC.INDICATOR LAMP   OFF
  BATTERY CHARGING         0.0  %
  IGNITION TIMING #1       30.8 DEG
  IGNITION TIMING #2       30.8 DEG
  IGNITION TIMING #3       30.8 DEG
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* VEHICLE SPEED            44.3 MPH
* ENGINE SPEED             2026 rpm
* TRANSAXLE RANGE SW       DRIVE
  MALFUNC.INDICATOR LAMP   OFF
  BATTERY CHARGING         0.0  %
  IGNITION TIMING #1       30.8 DEG
  IGNITION TIMING #2       30.8 DEG
  IGNITION TIMING #3       30.8 DEG
```

Fig. 3 Normal data

Service standard
Approximately 40 Km/h

NOTE

The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

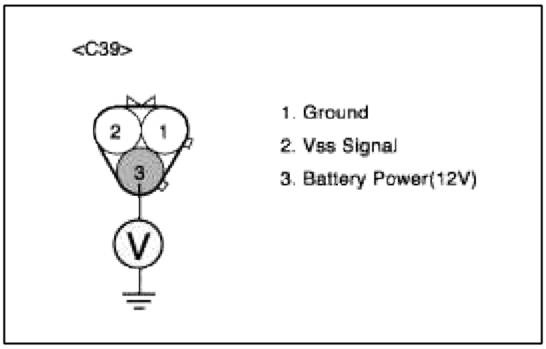
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect VSS sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

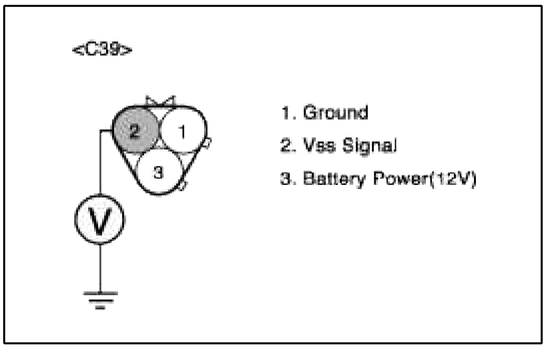
Open circuit or short circuit to chassis ground between VSS harness connector and battery power circuit. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when the connector of VSS is disconnected, the voltage of terminal 3 is 1V.
Possible cause:Open circuit or short circuit after I/P-J/BOX fuse(10A)

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect VSS sensor connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 2 of sensor harness connector and chassis ground.



(5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

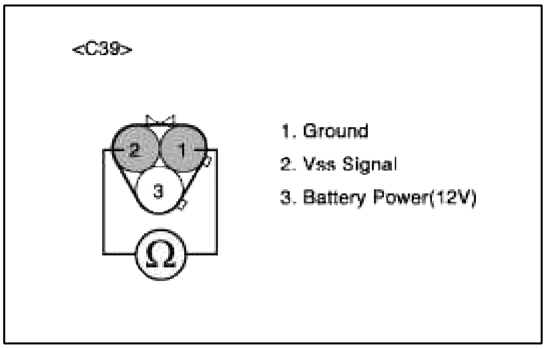
NO

Open or short circuit between VSS harnece connector and PCM harness connector.
Faulty PCM
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

1. In case,when the connector of VSS is disconnected, the voltage of terminal 2 is 0V.
   Possible cause: If the terminal 2 voltage of VSS is 0V, the possible cause is likely to be open or bad PCM.
2. The voltage of terminal 2 is about 6.5~7.5V when the VSS connector is disconnected.

2. Check for short to ground in harness
   When the voltage of VSS terminal 2 is 0V, the inspection of short circuit is recommended to find open or short circuit of signal line.
   (1) Ignition "OFF"
   (2) Disconnect VSS sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 and 2 of sensor harness connector.



   (5) Is measure resistance within Specification?

YES

Go to "Ground Circuit Inspection" procedure.

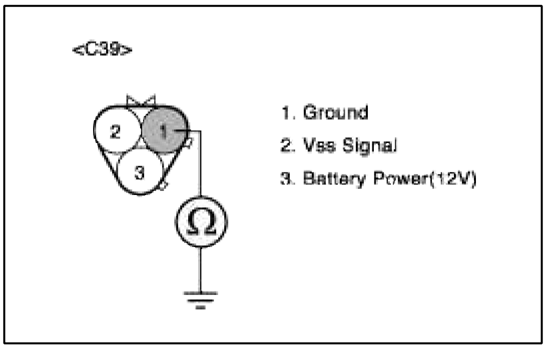
NO

short circuit to chassis ground between VSS harness connector and PCM harness connector.
short circuit between VSS signal circuit and ground circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect VSS sensor connector.
3. Ignition "ON" & Engine "OFF"

4. Measure voltage or resistance between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Go to "Component Inspection" procedure.

NO

Open circuit between VSS harnece connector and Chassis ground.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

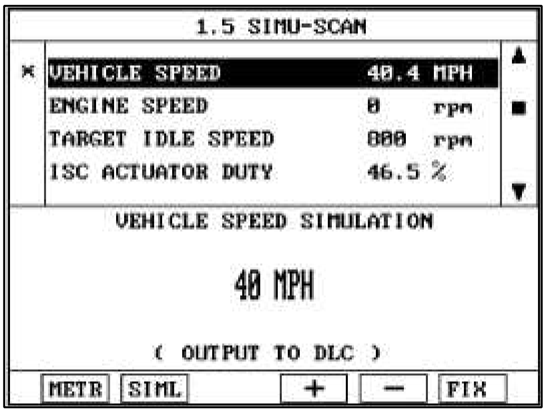
1. Check PCM

The purpose of checking ECM is to determine whether there is any malfunction of PCM .

(1) Ignition "OFF"

(2) Connect Scantool and Engine "ON "

(3) Select simulation function on scantool.



```
1.5 SIMU-SCAN
× VEHICLE SPEED          40.4 MPH
  ENGINE SPEED           0    rpm
  TARGET IDLE SPEED      800  rpm
  ISC ACTUATOR DUTY      46.5 %
      VEHICLE SPEED SIMULATION
               40 MPH
          ( OUTPUT TO DLC )
```

(4) Is VSS sensor signal value changed according to simulation voltage ?

YES

Check VSS for contamination, deterioration, or damage. Clean VSS with suitable cleaner as necessary and let air dry before reinstalling. If problem still exists, Substitute with a known-good VSS and check for proper operation.

If the problem is corrected, replace VSS and then go to "Verification of vehicle Repair" procedure

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

YES

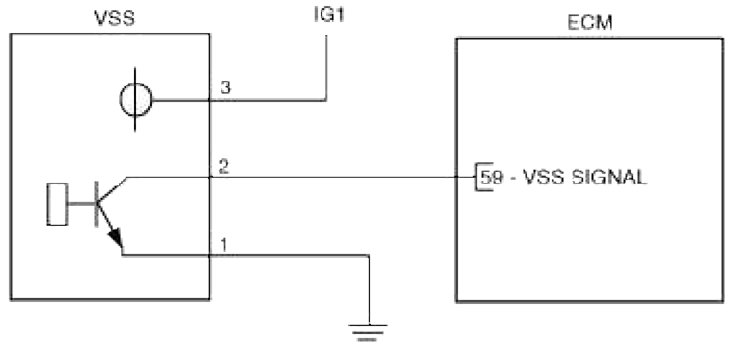
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

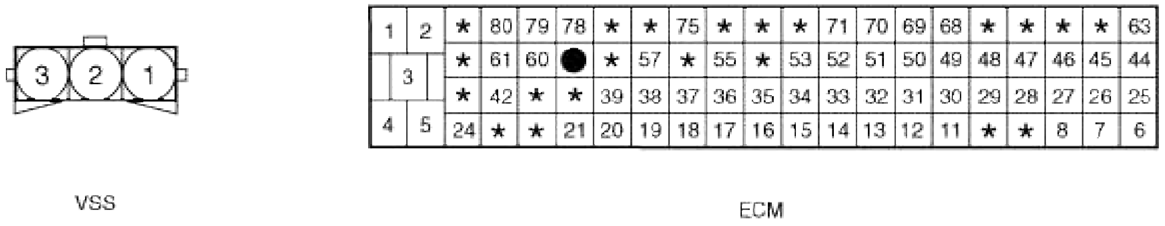
[CIRCUIT DIAGRAM]


VSS
IG1
ECM
3
2
1
59 - VSS SIGNAL

[CONNECTION INFORMATION]

Terminal	Connected to	Function
2	ECM terminal 59	Sensor Ground
1	Chassis Ground	VSS Signal
3	IG 1	Battery Voltage

[HARNESS CONNECTORS]


3 2 1
VSS
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 ● ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
ECM

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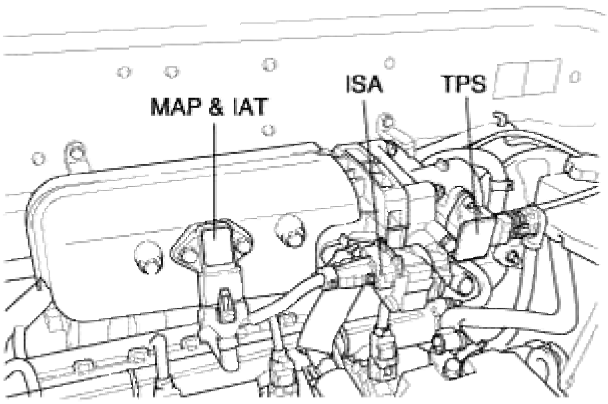
COMPONENT INSPECTION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

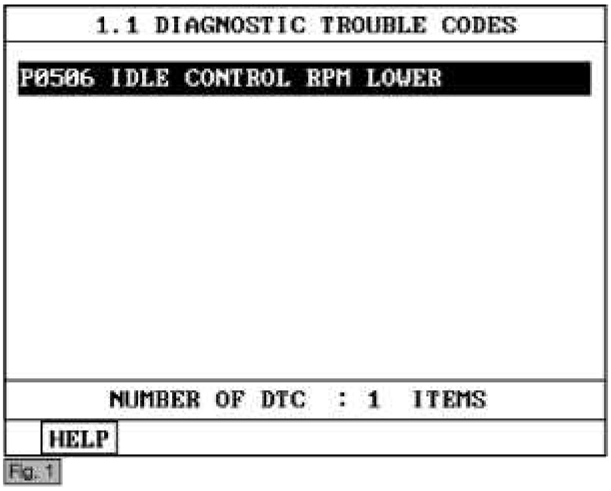
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Rationality check, low	● Intake hose ● Carbon fouied throttle plate - Accelrator cable adjussted improperly ● faulty ISCA ● faulty TPS ● Faulty PCM
Threshold value	● Eng speed - desired eng speed : 200rpm	
Enable Conditions	● Vehicle speed = 0 ● Coolant temperature > 75 degC(167 °F) ● Intake air temperature > 9.75 degC(49.55 °F) ● Altitude (model) < 2500 m ● I-controller < -14.8 %	
Diagnostic Time	● 8 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ISC actuator duty" parameter on the scantool.

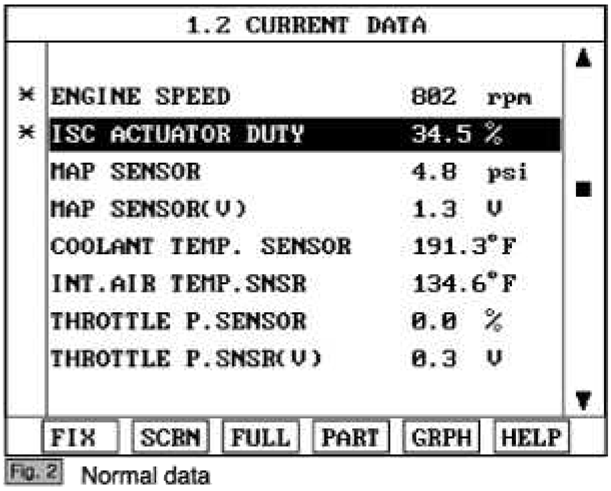


```
1.1 DIAGNOSTIC TROUBLE CODES

P0506 IDLE CONTROL RPM LOWER

NUMBER OF DTC  : 1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* ENGINE SPEED            802  rpm
* ISC ACTUATOR DUTY       34.5 %
  MAP SENSOR              4.8  psi
  MAP SENSOR(V)           1.3  V
  COOLANT TEMP. SENSOR    191.3°F
  INT.AIR TEMP.SNSR       134.6°F
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SNSR(V)      0.3  V
```

Fig. 2 Normal data

Service standard

A/CON switch OFF : 25~45%

A/CON switch ON : 35~55%

NOTE

The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" proceduredure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

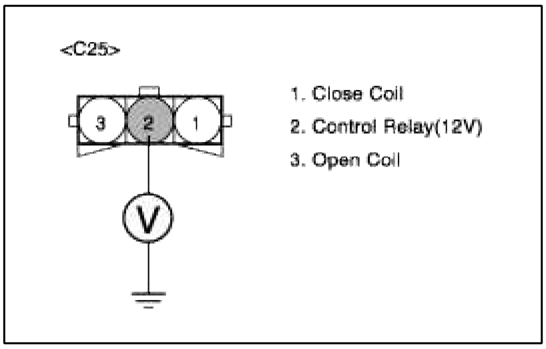
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECITON

1. Ignition "OFF"
2. Disconnect ISCA connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

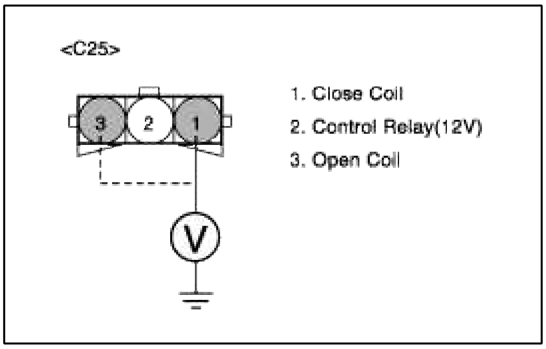
Short circuit to chassis ground between ISCA harness connector and control relay.
Open circuit between ISCA harness connector and control relay.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

NOTE

1. In case,when ISCA connector is disconnected, the voltage of ISCA terminal 2 is 0V.
   Possible cause: Open or short circuit in battery power line after fuse (15A INJ).
2. PCM also sets P1505 and P1507 if it detects the open circuit in ISCA power line.

CONTROL CIRCUIT INSPECTION

1. Check for open in harness
    (1) Ignition "OFF"
    (2) Disconnect ISCA connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure voltage between terminal 1 , 3 of sensor harness connector and chassis ground.



    (5) Is measure voltage within Specification?

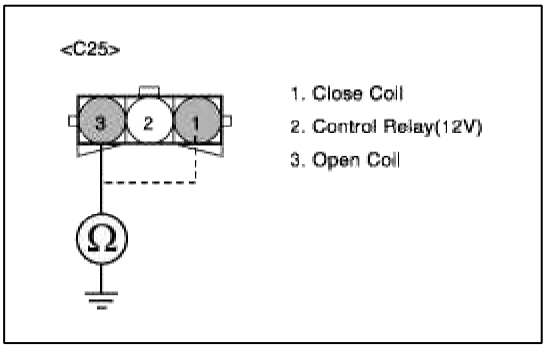
YES

Go to "Check for short to ground in harness " as below.

NO

Open or Short circuit to chassis ground between ISCA harness connector and PCM harness connector. Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for short to ground in harness
    (1) Ignition "OFF"
    (2) Disconnect ISCA connector and PCM connector.
    (3) Ignition "ON" & Engine "OFF"
    (4) Measure resistance between terminal 1 , 3 of sensor harness connector and chassis ground.



    (5) Is measure resistance within Specification?

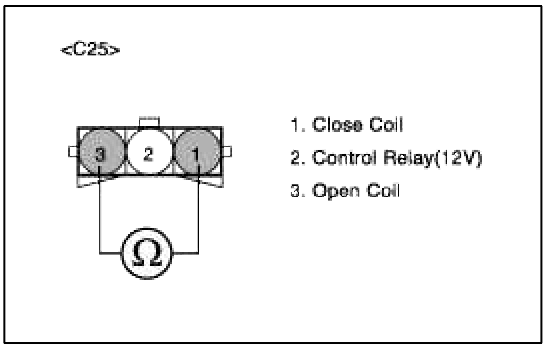
YES

Go to "Check for short between open coil and close coil harness " as below.

NO

Short circuit to chassis ground between ISCA harness connector and PCM harness connector. Repair as necessary and go to "Verification Vehicle Repair" procedure.

3. Check for short between open coil and close coil harness
   (1) Ignition "OFF"
   (2) Disconnect ISCA connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1,3 of sensor harness connector.


<C25>
3
2
1
Ω
1. Close Coil
2. Control Relay(12V)
3. Open Coil

   (5) Is measure resistance within Specification?

YES

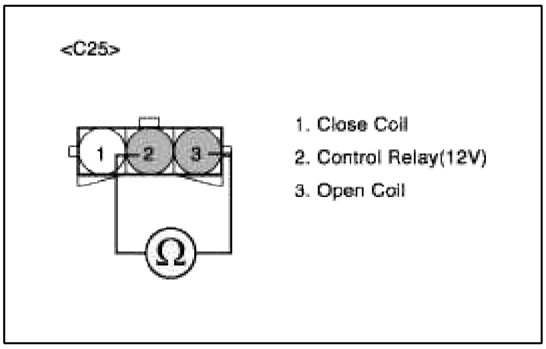
Go to "Component Inspection" procedure.

NO

Shorted circuit between ISCA open signal circuit and close signal circuit.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check ISCA
   (1) Measure resistance between terminal 2 and 3 of sensor connector(To sensor side)


<C25>
1
2
3
Ω
1. Close Coil
2. Control Relay(12V)
3. Open Coil

   (2) Is measure resistance within Specification?

YES

Go to "Check for ISCA sticking " as below.

NO

Substitute with a known-good ISCA and check for proper operation. If the problem is corrected, replace ISCA and then go to "Verification of Vehicle Repair" procedure.

2. Check for ISCA sticking.
   (1) Ignition "OFF"
   (2) Check that ISCA actuator valve is clean and not sticking.
   (3) Check that throttle lever return spring is clean and sticking.
   (4) Check intake air system and vacuum hoses to intake air system.
   (5) Are the results of these checks OK?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good ISCA and check for proper operation. If the problem is corrected, replace ISCA and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

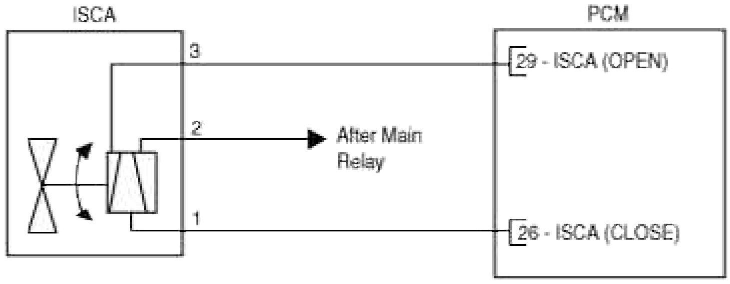
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

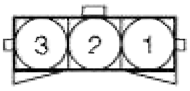
[CIRCUIT DIAGRAM]



[CONNECTION INFORMATION]

Terminal	Connected to	Function
3	PCM terminal 29	ISCA (OPEN)
2	Main Relay	Battery voltage
1	PCM terminal 26	ISCA (CLOSE)

[HARNESS CONNECTORS]



ISCA

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	●	28	27	●	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

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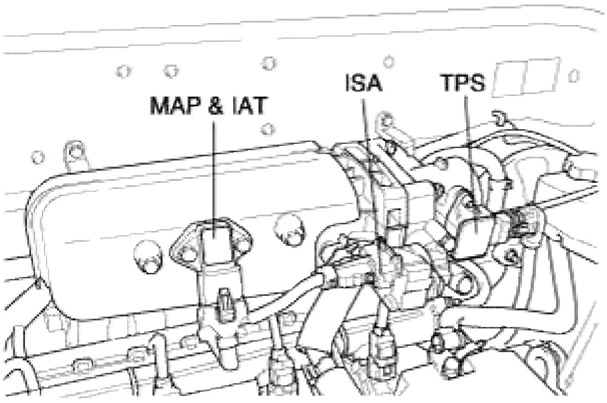
COMPONENT INSPECTION



GENERAL DESCTIPTION

DTC DESCRIPTION

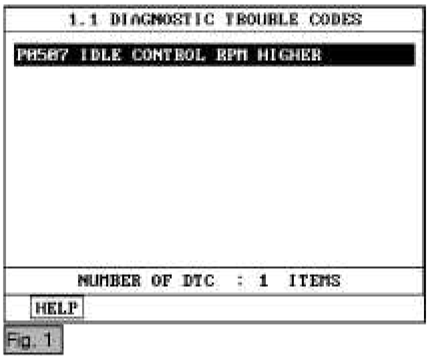
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Rationality check, high	● Air leak in intake system ● Vacuum hose and PCV ● Accelrator cable adjussted improperly ● faulty ISCA ● faulty TPS ● faulty PCSV ● Faulty PCM
Threshold value	● Eng speed - desired eng speed : < -100 rpm	
	● Fuel cut - off : > 2 times	
Enable Conditions	● Vehicle speed = 0 ● Coolant temperature > 75 degC(167 °F) ● Intake air temperature > 9.75 degC(49.55 °F) ● Altitude (model) < 2500 m ● I-controller > 14.8 % ● Idle control enabled	
Diagnostic Time	● 15 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.

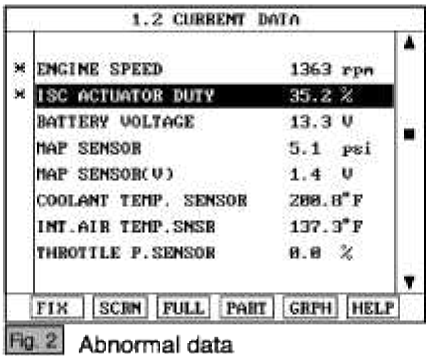
3. Monitor the "ISC actuator duty" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0507 IDLE CONTROL RPM HIGHER

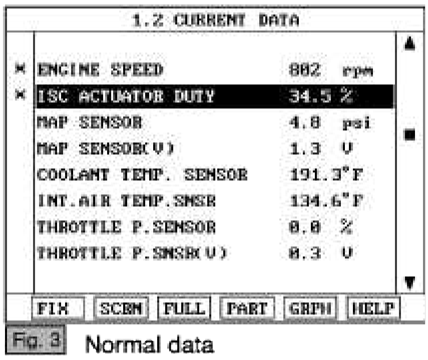
NUMBER OF DTC : 1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* ENGINE SPEED            1363 rpm
* ISC ACTUATOR DUTY       35.2 %
  BATTERY VOLTAGE         13.3 V
  MAP SENSOR              5.1  psi
  MAP SENSOR(V)           1.4  V
  COOLANT TEMP. SENSOR    200.8°F
  INT.AIR TEMP.SNSR       137.3°F
  THROTTLE P.SENSOR       0.0  %
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED            802  rpm
* ISC ACTUATOR DUTY       34.5 %
  MAP SENSOR              4.8  psi
  MAP SENSOR(V)           1.3  V
  COOLANT TEMP. SENSOR    191.3°F
  INT.AIR TEMP.SNSR       134.6°F
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SNSR(V)      0.3  V
```

Fig. 3 Normal data

Service standard
A/CON switch OFF : 25~45%
A/CON switch ON : 35~55%

> **NOTE**
>
> The data shown above is only for reference and there may be a little difference actually.

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" proceduredure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

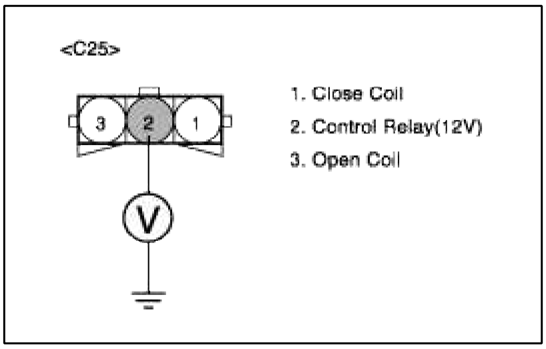
NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ISCA connector.
3. .Ignition "ON" & Engine "OFF"

4. Measure voltage between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

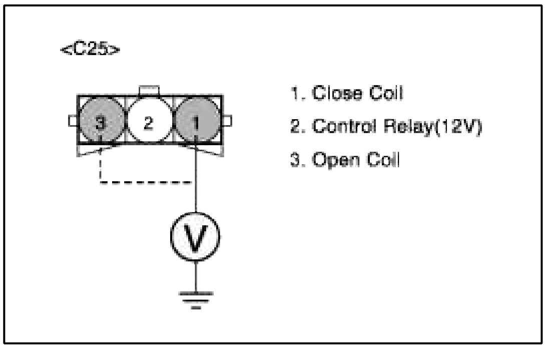
Short circuit to chassis ground between ISCA harness connector and control relay.
Open circuit between ISCA harness connector and control relay.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

NOTE

1. In case,when ISCA connector is disconnected, the voltage of ISCA terminal 2 is 0V.
   Possible cause: Open or short circuit in battery power line after fuse (15A INJ).
2. ECM also sets P1505 and P1507 if it detects the open circuit in ISCA power line.

CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect ISCA connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 1 , 3 of sensor harness connector and chassis ground.



   (5) Is measure voltage within Specification?

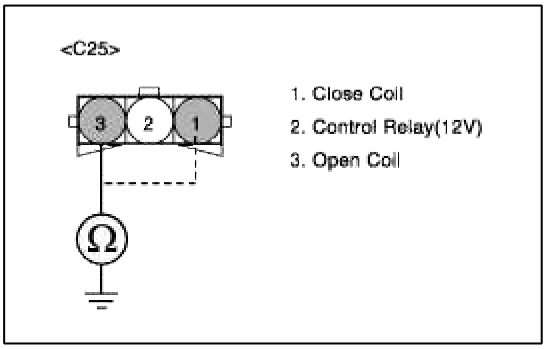
YES

Go to "Check for short to ground in harness " as below.

NO

Open or Short circuit to chassis ground between ISCA harness connector and PCM harness connector.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

2. Check for short to ground in harness
   - (1) Ignition "OFF"
   - (2) Disconnect ISCA connector and PCM connector.
   - (3) Ignition "ON" & Engine "OFF"
   - (4) Measure resistance between terminal 1 , 3 of sensor harness connector and chassis ground.



   - (5) Is measure resistance within Specification?

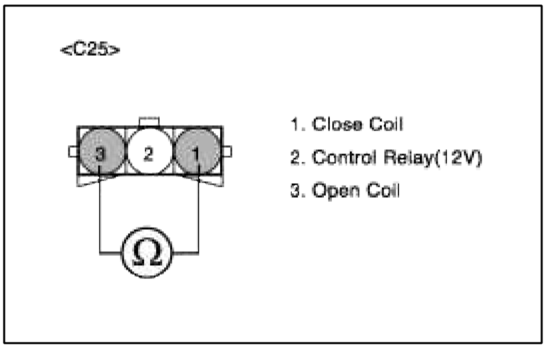
YES

Go to "Check for short between open coil and close coil harness " as below.

NO

Short circuit to chassis ground between ISCA harness connector and PCM harness connector. Repair as necessary and go to "Verification Vehicle Repair" procedure.

3. Check for short between open coil and close coil harness
   - (1) Ignition "OFF"
   - (2) Disconnect ISCA connector and PCM connector.
   - (3) Ignition "ON" & Engine "OFF"
   - (4) Measure resistance between terminal 1 , 3 of sensor harness connector.



   - (5) Is measure resistance within Specification?

YES

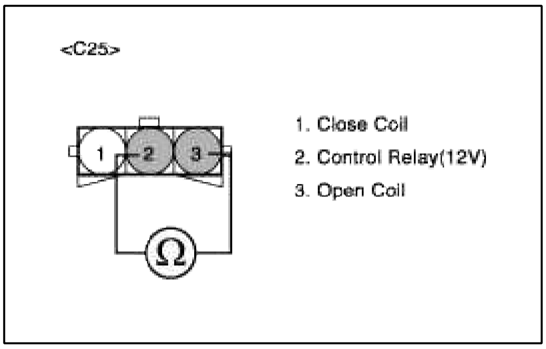
Go to "Component Inspection" procedure.

NO

Shorted circuit between ISCA open signal circuit and close signal circuit. Repair as necessary and go to "Verification Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check ISCA
   (1) Measure resistance between terminal 2 and 3 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Go to "Check for ISCA sticking " as below.

NO

Substitute with a known-good ISCA and check for proper operation. If the problem is corrected, replace ISCA and then go to "Verification of Vehicle Repair" procedure.

2. Check for ISCA sticking.
   (1) Ignition "OFF"
   (2) Check that ISCA actuator valve is clean and not sticking.
   (3) Check that throttle lever return spring is clean and sticking.
   (4) Check intake air system and vacuum hoses to intake air system.
   (5) Are the results of these checks OK?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good ISCA and check for proper operation. If the problem is corrected, replace ISCA and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

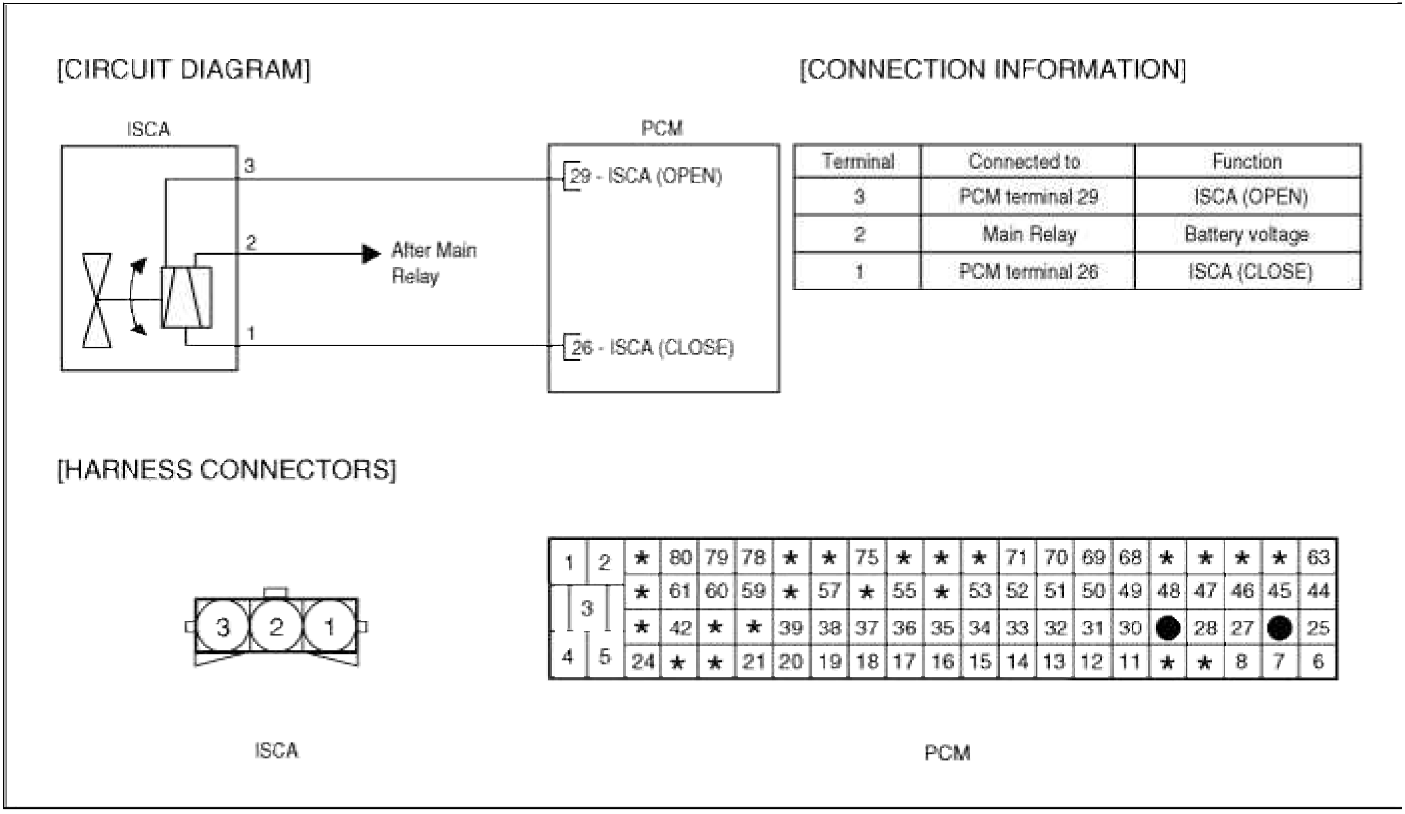
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

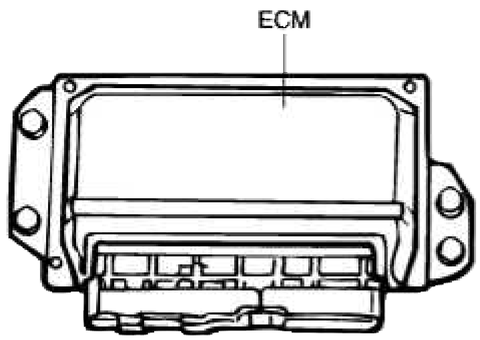

[CIRCUIT DIAGRAM]
ISCA
PCM
3
2
1
After Main Relay
29 - ISCA (OPEN)
26 - ISCA (CLOSE)
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
3
2
1
ISCA
PCM

Terminal	Connected to	Function
3	PCM terminal 29	ISCA (OPEN)
2	Main Relay	Battery voltage
1	PCM terminal 26	ISCA (CLOSE)

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	●	28	27	●	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P0605

COMPONENT LOCATION



GENERAL DESCTIPTION

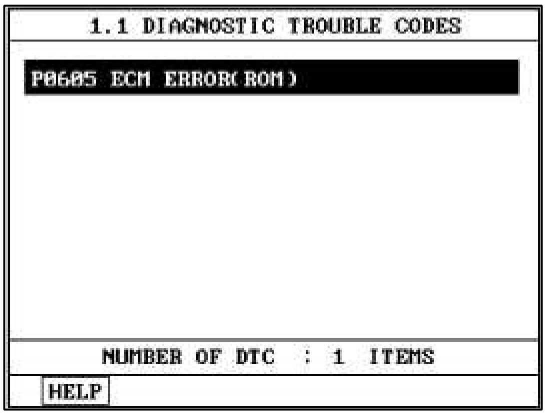
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Internal control module check	● Faulty PCM
Threshold value	● Check sum fault(ROM)	
Enable Conditions	● PCM H/W modification required	
Diagnostic Time	● Once / drving	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "CURRENT DATA" parameter on the scantool.



1.1 DIAGNOSTIC TROUBLE CODES

P0605 ECM ERROR(ROM)

NUMBER OF DTC : 1 ITEMS

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" proceduredure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

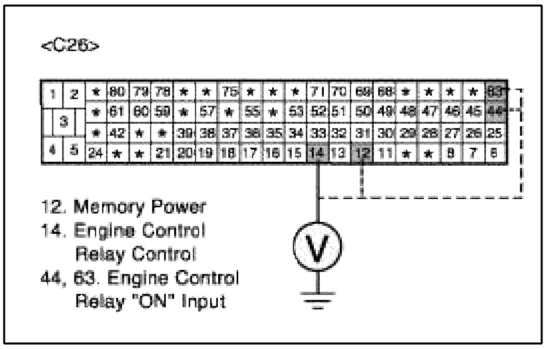
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check for open in harness at Memory power input
   (1) Ignition "OFF"
   (2) Connect PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 12 of PCM harness connector and chassis ground.


<C26>
12. Memory Power
14. Engine Control Relay Control
44, 63. Engine Control Relay "ON" Input
V

   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure

NO

Open or short circuit to chassis ground between PCM harness connector and Control relay ON input circuit.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check PCM

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

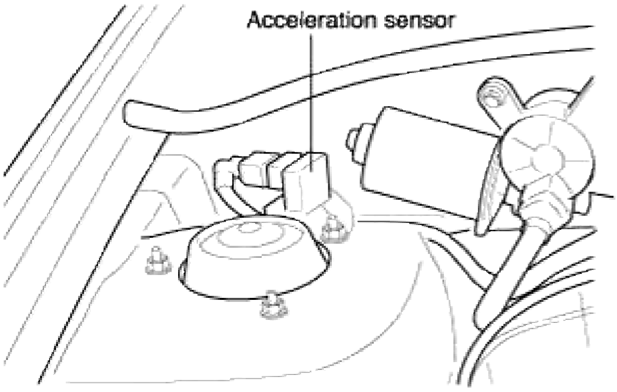
NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

Fuel System > Troubleshooting > P1307

COMPONENT LOCATION


Acceleration sensor

GENERAL DESCTIPTION

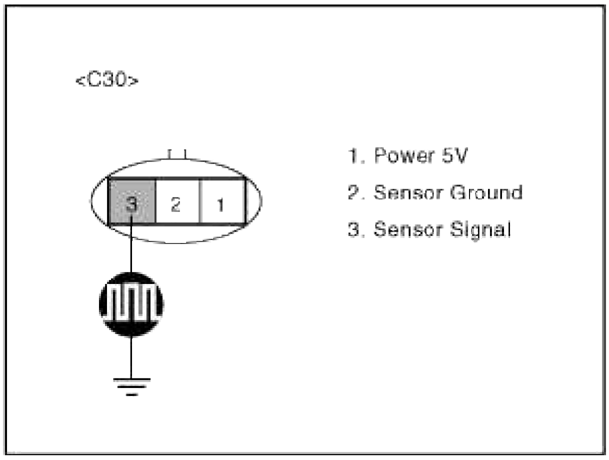
DTC DESCRIPTION

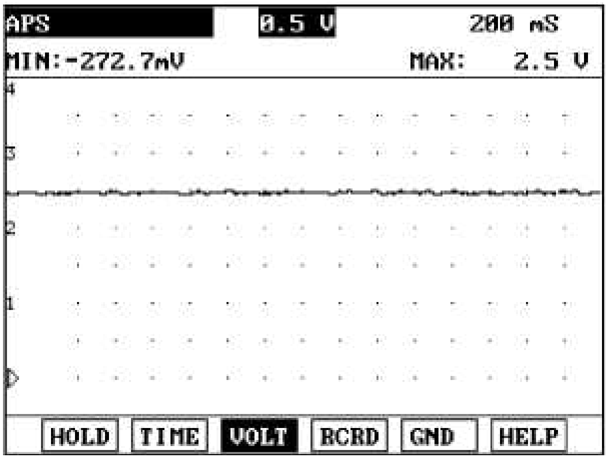
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Rationality check	● Poor connections ● Faulty acceleration sensor ● High resistance in ground ● Faulty PCM
Threshold value	● Signal at vehicle standstill is alternated : > 3 times	
Enable Conditions		
Diagnostic Time	● Continuous	
Fail Safe	● None	

WAVEFORM INSPECTION

1. Engine "ON"
2. Monitor wave form at the terminal 3 of Acceleration sensor.


<C30>
3
2
1
1. Power 5V
2. Sensor Ground
3. Sensor Signal


APS
0.5 V
200 mS
MIN:-272.7mV
MAX: 2.5 V
4
3
2
1
HOLD
TIME
VOLT
RCRD
GND
HELP

3. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

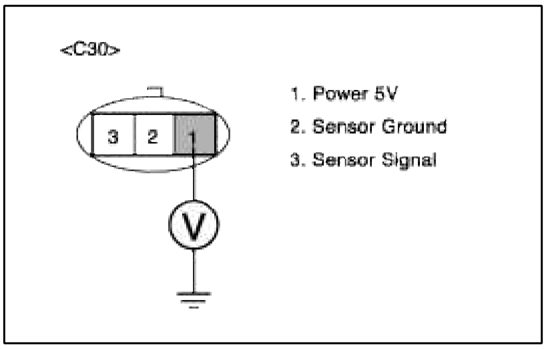
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect Acceleration sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

Short circuit to chassis ground between Acceleration sensor harness connector and reference voltage.

Open circuit between Acceleration sensor harness connector and PCM connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

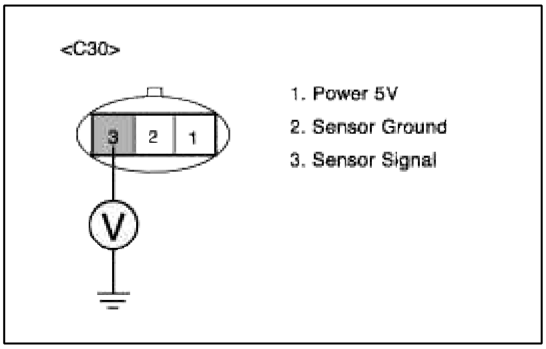
NOTE

In case,when acceleration sensor connector is disconnected,the voltage at terminal 1 is 0V.

Possible cause: Open or short circuit in harness between terminal 32 of PCM and terminal 1 of acceleration sensor or PCM

SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
   - (1) Ignition "OFF"
   - (2) Disconnect Acceleration sensor connector.
   - (3) Ignition "ON" & Engine "OFF"
   - (4) Measure voltage between terminal 3 of sensor harness connector and chassis ground.



   - (5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

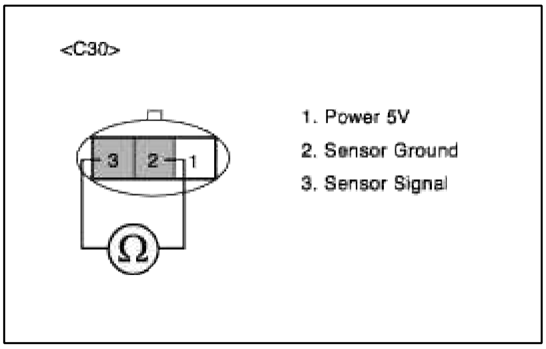
Open circuit or short circuit to chassis ground between Acceleration sensor harness connector and signal circuit.

Open circuit between Acceleration sensor harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when acceleration sensor connector is disconnected,the voltage at terminal 3 is 0V.
>
> Possible cause: Open or short circuit in harness between terminal 60 of PCM and terminal 3 of acceleration sensor or PCM

2. Check for short to ground in harness
   - (1) Ignition "OFF"
   - (2) Disconnect Acceleration sensor connector and PCM connector.
   - (3) Ignition "ON" & Engine "OFF"
   - (4) Measure resistance between terminal 2 and 3 of sensor harness connector.



(5) Is measure resistance within Specification?

YES

Go to "Ground Circuit Inspection" procedure.

NO

Open circuit or short circuit to chassis ground between Acceleration sensor harness connector and signal circuit.

Open circuit between Acceleration sensor harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

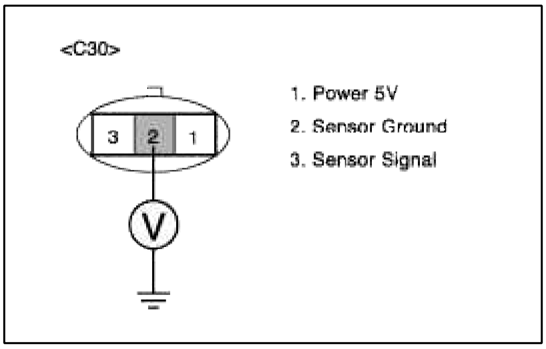
NOTE

In case,when acceleration sensor connector is disconnected,the voltage at terminal 3 is 0V.

Possible cause: Open or short circuit in harness between terminal 60 of PCM and terminal 3 of acceleration sensor or PCM

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect Acceleration sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Substitute with a known-good Acceleration sensor and check for proper operation. If the problem is corrected, replace Acceleration sensor and then go to "Verification of Vehicle Repair" procedure.

NO

Open circuit between Acceleration sensor harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when acceleration sensor connector is disconnected,the resistance at terminal 2 is infinite.

Possible cause: Open in ground circuit between terminal 17 of PCM and terminal 2 of acceleration sensor.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

YES

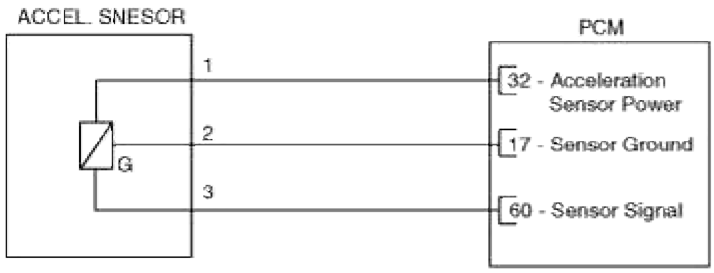
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

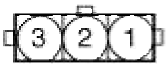
[CIRCUIT DIAGRAM]


ACCEL. SNESOR
1
2
3
G
PCM
32 - Acceleration Sensor Power
17 - Sensor Ground
60 - Sensor Signal

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM terminal 32	Acceleration Sensor Power(5V)
2	PCM terminal 17	Sensor Ground
3	PCM terminal 60	Sensor Signal

[HARNESS CONNECTORS]



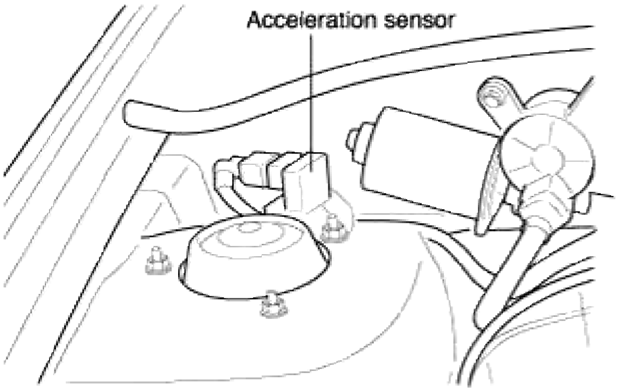
ACCELERATION SENSOR

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	●	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	●	31	30	29	28	27	26	25
4	5	24	★	★	21	20	19	18	●	16	15	14	13	12	11	★	★	8	7	6

PCM

Fuel System > Troubleshooting > P1308

COMPONENT LOCATION


Acceleration sensor

GENERAL DESCTIPTION

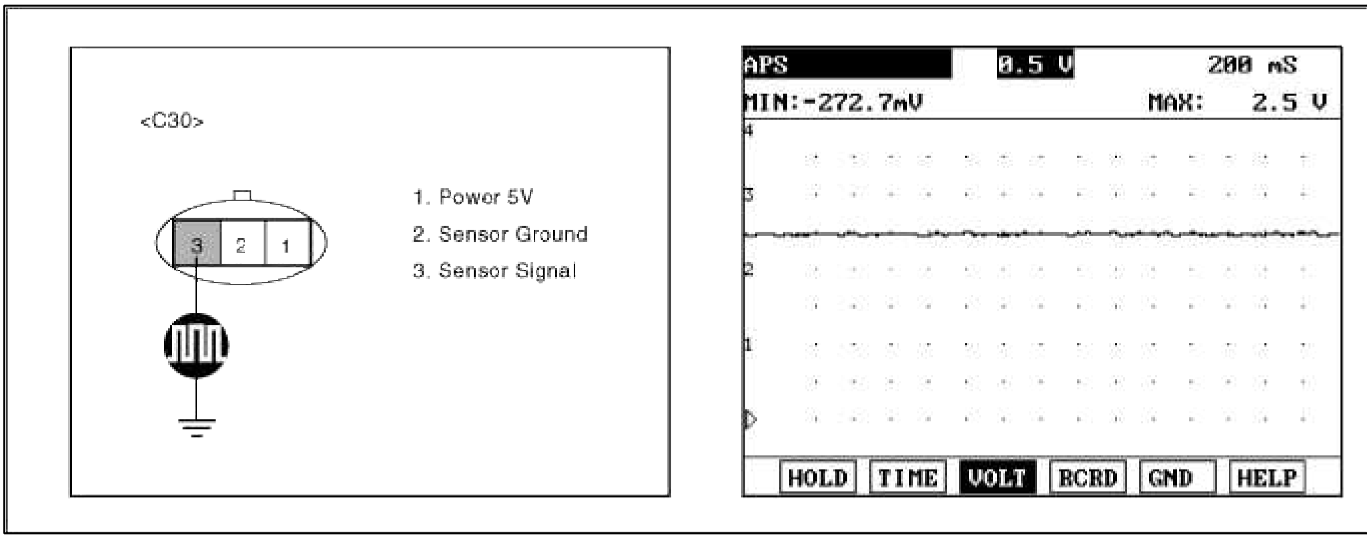
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, Low	● Short to ground in signal circuit (pin 60 to 17) ● Open in power circuit (pin 32) ● Faulty Acceleration sensor ● Faulty PCM
Threshold value	● Voltage : < 1.5V	
Enable Conditions		
Diagnostic Time	● Continuous	
Fail Safe	● None	

WAVEFORM INSPECTION

1. Engine "ON"
2. Monitor wave form at the terminal 3 of Acceleration sensor.



3. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

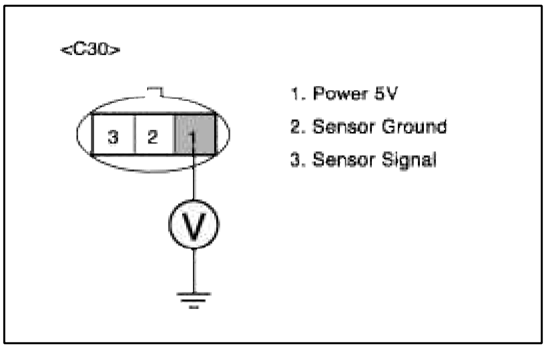
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect Acceleration sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 1 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Signal circuit inspection" procedure.

NO

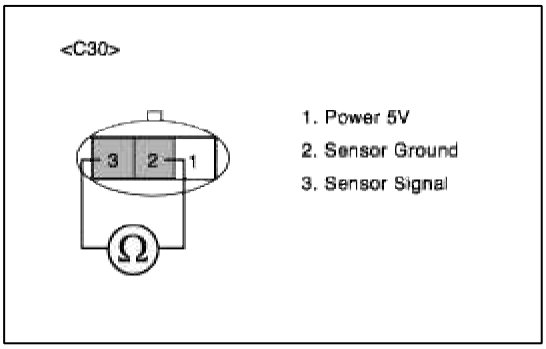
Short circuit to chassis ground between Acceleration sensor harness connector and reference voltage.
Open circuit between Acceleration sensor harness connector and PCM connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when acceleration sensor connector is disconnected,the voltage at terminal 1 is 0V.
Possible cause: Open or short circuit in harness between terminal 32 of PCM and terminal 1 of acceleration sensor or PCM

SIGNAL CIRCUIT INSPECTION

1. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect Acceleration sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 2 and 3 of sensor harness connector.



(5) Is measure resistance within Specification?

YES

Substitute with a known-good Acceleration sensor and check for proper operation. If the problem is corrected, replace Acceleration sensor and then go to "Verification of Vehicle Repair" procedure.

NO

Open circuit or short circuit to chassis ground between Acceleration sensor harness connector and signal circuit.

Open circuit between Acceleration sensor harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when acceleration sensor connector is disconnected,the voltage at terminal 3 is 0V.

Possible cause: Open or short circuit in harness between terminal 60 of PCM and terminal 3 of acceleration sensor or PCM

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

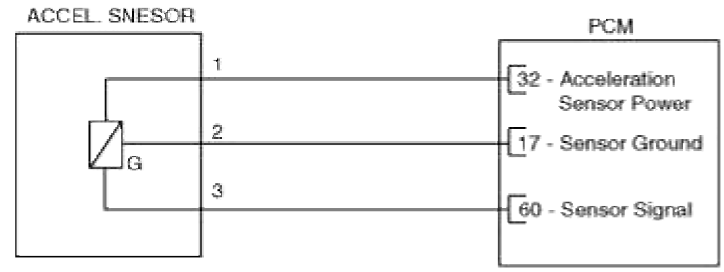
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

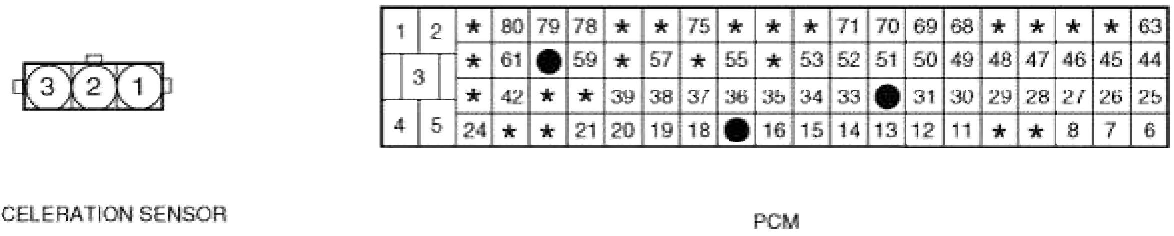
[CIRCUIT DIAGRAM]


ACCEL. SNESOR
1
2
3
G
PCM
32 - Acceleration Sensor Power
17 - Sensor Ground
60 - Sensor Signal

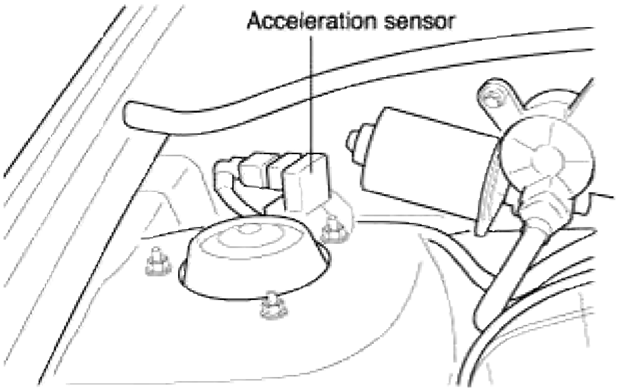
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM terminal 32	Acceleration Sensor Power(5V)
2	PCM terminal 17	Sensor Ground
3	PCM terminal 60	Sensor Signal

[HARNESS CONNECTORS]


3 2 1
ACCELERATION SENSOR
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 ● 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 ● 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 ● 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

COMPONENT LOCATION



GENERAL DESCTIPTION

DTC DESCRIPTION

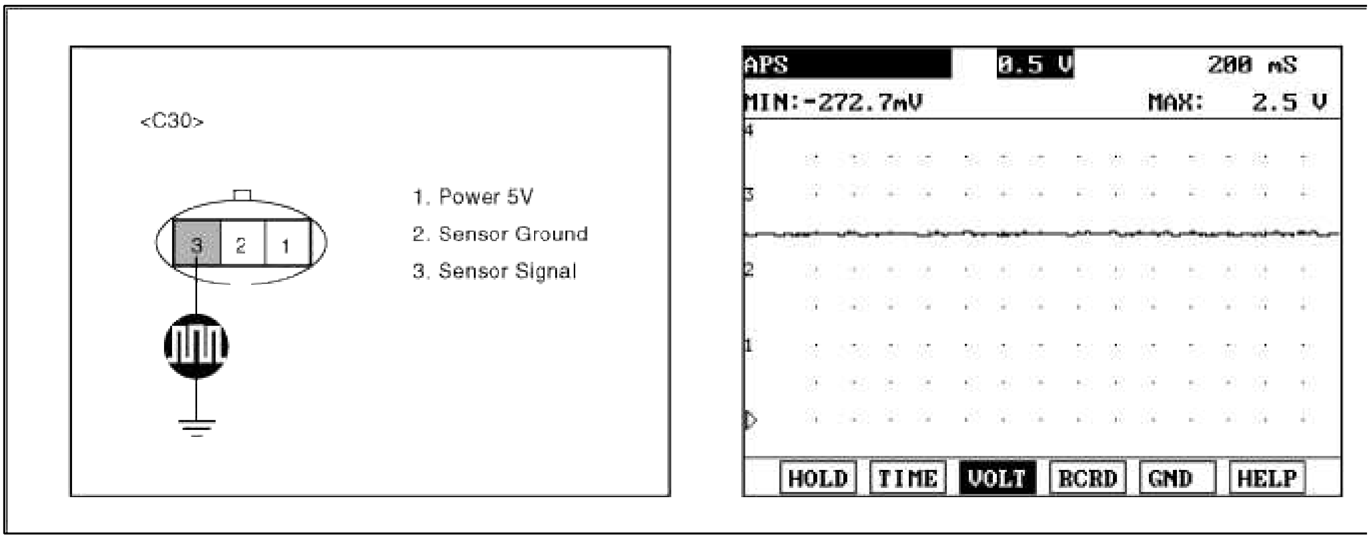
DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check, High	● Open in signal circuit ● Short to battery in signal circuit (pin 60 to 32) ● Open in ground circuit ● Poor connection of Acceleration sensor ● Faulty Acceleration sensor ● Faulty PCM
Threshold value	● Voltage : > 3.5V	
Enable Conditions		
Diagnostic Time	● Continuous	
Fail Safe	● None	

WAVEFORM INSPECTION

1. Engine "ON"

2. Monitor wave form at the terminal 3 of Acceleration sensor.



3. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Signal circuit inspection" procedure.

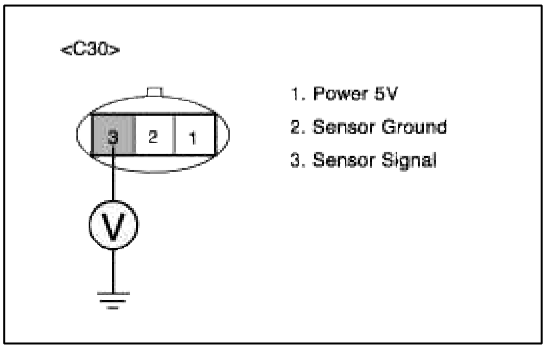
SIGNAL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"

   (2) Disconnect Acceleration sensor connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 3 of sensor harness connector and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

Open circuit or short circuit to chassis ground between Acceleration sensor harness connector and signal circuit.

Open circuit between Acceleration sensor harness connector and PCM harness connector.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

In case,when acceleration sensor connector is disconnected,the voltage at terminal 3 is 0V.

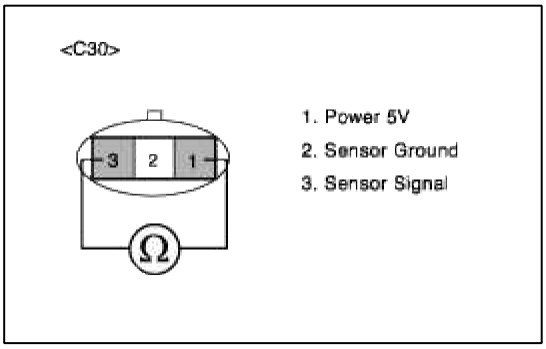
Possible cause: Open or short circuit in harness between terminal 60 of PCM and terminal 3 of acceleration sensor or PCM

2. Check for short to power in harness
   (1) Ignition "OFF"

   (2) Disconnect Acceleration sensor connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure resistance between terminal 1 and 3 of sensor harness connector.



(5) Is measure resistance within Specification?

YES

Go to "Ground Circuit Inspection" procedure.

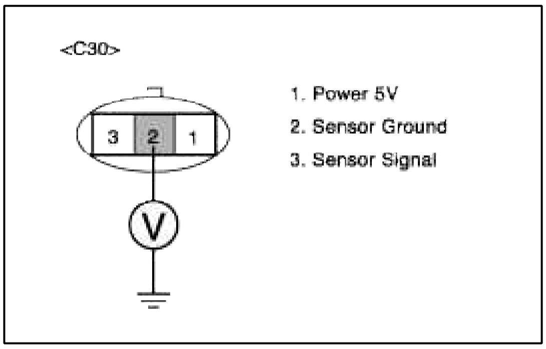
NO

Short circuit between reference voltage(5V) circuit and signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> When the terminal 1 and 3 are shorted ,the resistance measured is below 1Ω.

GROUND CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect Acceleration sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage or resistance between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage or resistance within Specification?

YES

Substitute with a known-good Acceleration sensor and check for proper operation. If the problem is corrected, replace Acceleration sensor and then go to "Verification of Vehicle Repair" procedure.

NO

Open circuit between Acceleration sensor harness connector and PCM harness connector.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when acceleration sensor connector is disconnected,the resistance at terminal 2 is infinite.
> Possible cause: Open in ground circuit between terminal 17 of PCM and terminal 2 of acceleration sensor.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

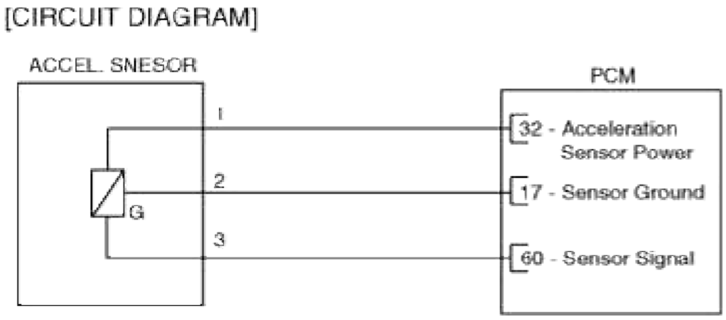
YES

Go to the applicable troubleshooting procedure.

NO

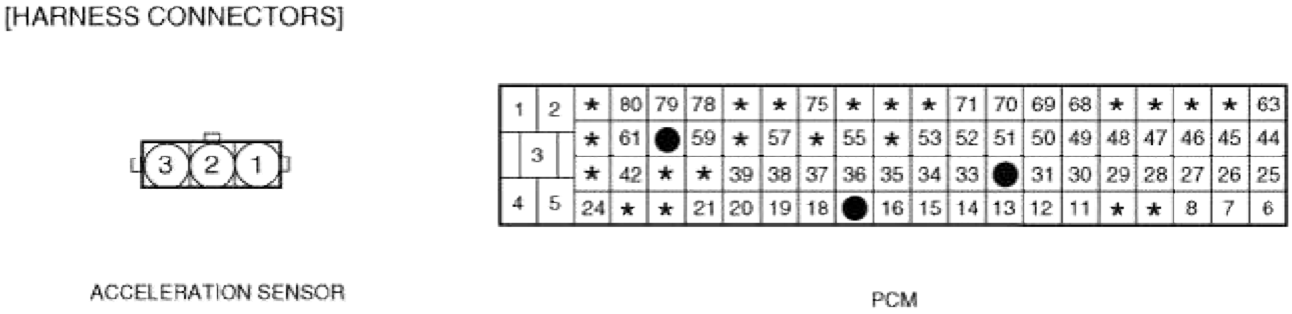
System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
ACCEL. SNESOR
1
2
3
G
PCM
32 - Acceleration Sensor Power
17 - Sensor Ground
60 - Sensor Signal

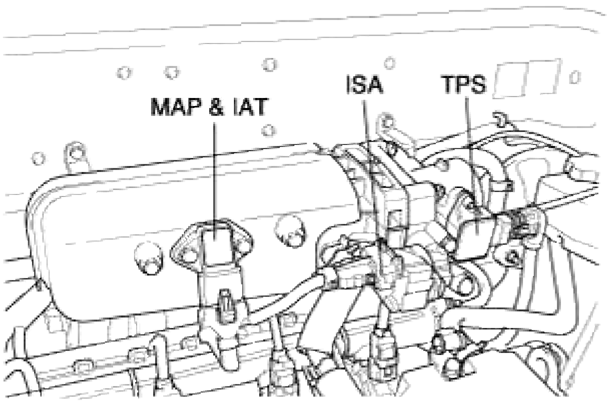
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	PCM terminal 32	Acceleration Sensor Power(5V)
2	PCM terminal 17	Sensor Ground
3	PCM terminal 60	Sensor Signal


[HARNESS CONNECTORS]
3 2 1
ACCELERATION SENSOR
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 ● 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 ● 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 ● 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P1505

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

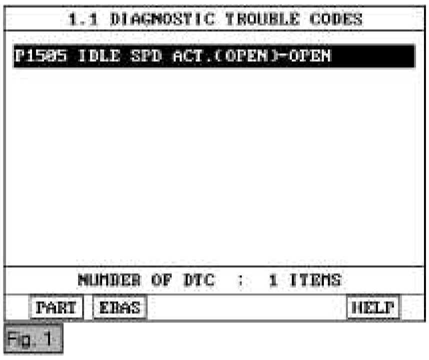
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy		● Open in battery circuit ● Open in control circuit ● Short to ground in control circuit ● Faulty ISCA ● Faulty PCM
Threshold value	● Shorted to GND / Disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continous	
Fail Safe	● The limp home value of ISCA depends on engine speed and throttle angle. -PCM controls with mapping data.	

MONITOR DTC STATUS

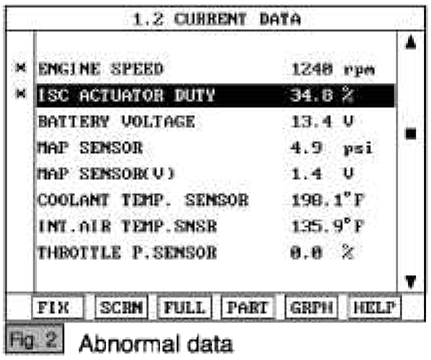
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P1505 IDLE SPD ACT.(OPEN)-OPEN

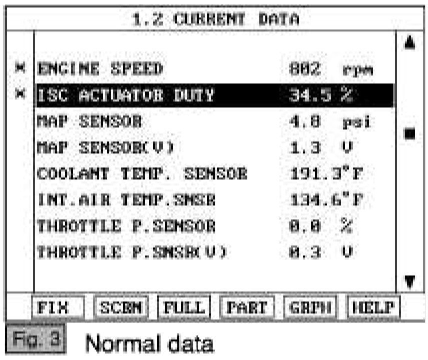
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
× ENGINE SPEED          1240 rpm
× ISC ACTUATOR DUTY     34.0 %
  BATTERY VOLTAGE       13.4 V
  MAP SENSOR            4.9  psi
  MAP SENSOR(V)         1.4  V
  COOLANT TEMP. SENSOR  190.1°F
  INT.AIR TEMP.SNSR     135.9°F
  THROTTLE P.SENSOR     0.0  %
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
× ENGINE SPEED          802  rpm
× ISC ACTUATOR DUTY     34.5 %
  MAP SENSOR            4.0  psi
  MAP SENSOR(V)         1.3  V
  COOLANT TEMP. SENSOR  191.3°F
  INT.AIR TEMP.SNSR     134.6°F
  THROTTLE P.SENSOR     0.0  %
  THROTTLE P.SNSR(V)    0.3  V
```

Fig. 3 Normal data

> **NOTE**
>
> The data shown above is only for reference and there may be a little difference actually.

Service standard
A/CON switch OFF : 25~45%
A/CON switch ON : 35~55%

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

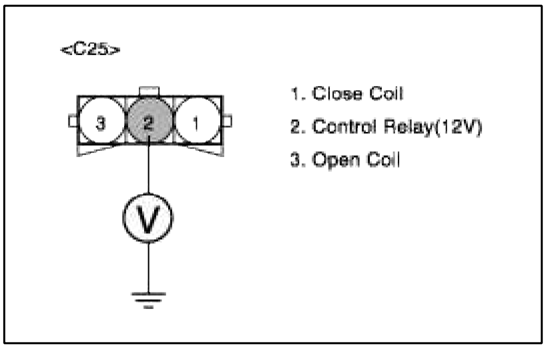
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ISCA sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

Short circuit to chassis ground between ISCA harness connector and control relay.
Open circuit between ISCA harness connector and control relay.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

1. In case,when ISCA connector is disconnected, the voltage of ISCA terminal 2 is 0V.
   Possible cause: Open or short circuit in battery power line after fuse (15A INJ).
2. ECM also sets P1505 and P1507 if it detects the open circuit in ISCA power line.

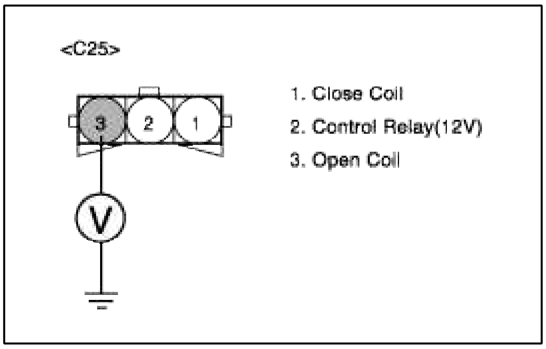
CONTROL CIRCUIT INSPECTION

1. Check for open in harness
    (1) Ignition "OFF"

    (2) Disconnect ISCA sensor connector.

    (3) Ignition "ON" & Engine "OFF"

    (4) Measure voltage between terminal 3 of sensor harness connector and chassis ground.



    (5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

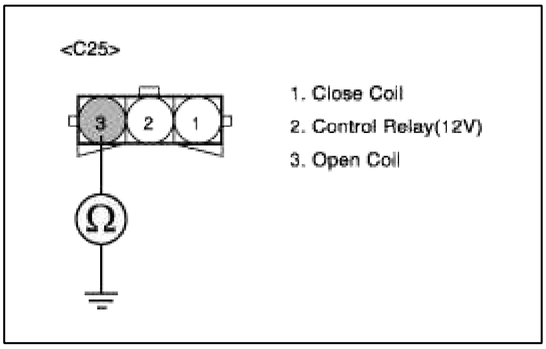
Open or Short circuit to chassis ground between ISCA harness connector and PCM harness connector. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for short to ground in harness
    (1) Ignition "OFF"

    (2) Disconnect ISCA sensor connector and PCM connector.

    (3) Ignition "ON" & Engine "OFF"

    (4) Measure resistance between terminal 3 of sensor harness connector and chassis ground.



    (5) Is measure resistance within Specification?

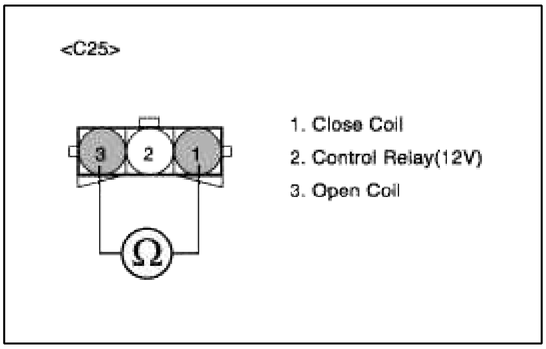
YES

Go to "Check for short between open coil and close coil harness " as below.

NO

Short circuit to chassis ground between ISCA harness connector and PCM harness connector. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

3. Check for short between open coil and close coil harness
   (1) Ignition "OFF"
   (2) Disconnect ISCA sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 and 3 of sensor harness connector.



   (5) Is measure resistance within Specification?

YES

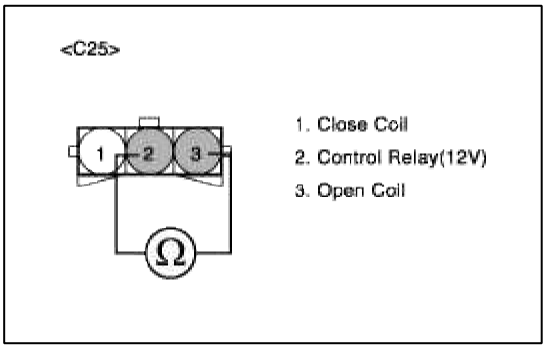
Go to "Component Inspection" procedure.

NO

Shorted circuit between ISCA open signal circuit and close signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check ISCA
   (1) Measure resistance between terminal 2 and 3 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good ISCA and check for proper operation. If the problem is corrected, replace ISCA and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

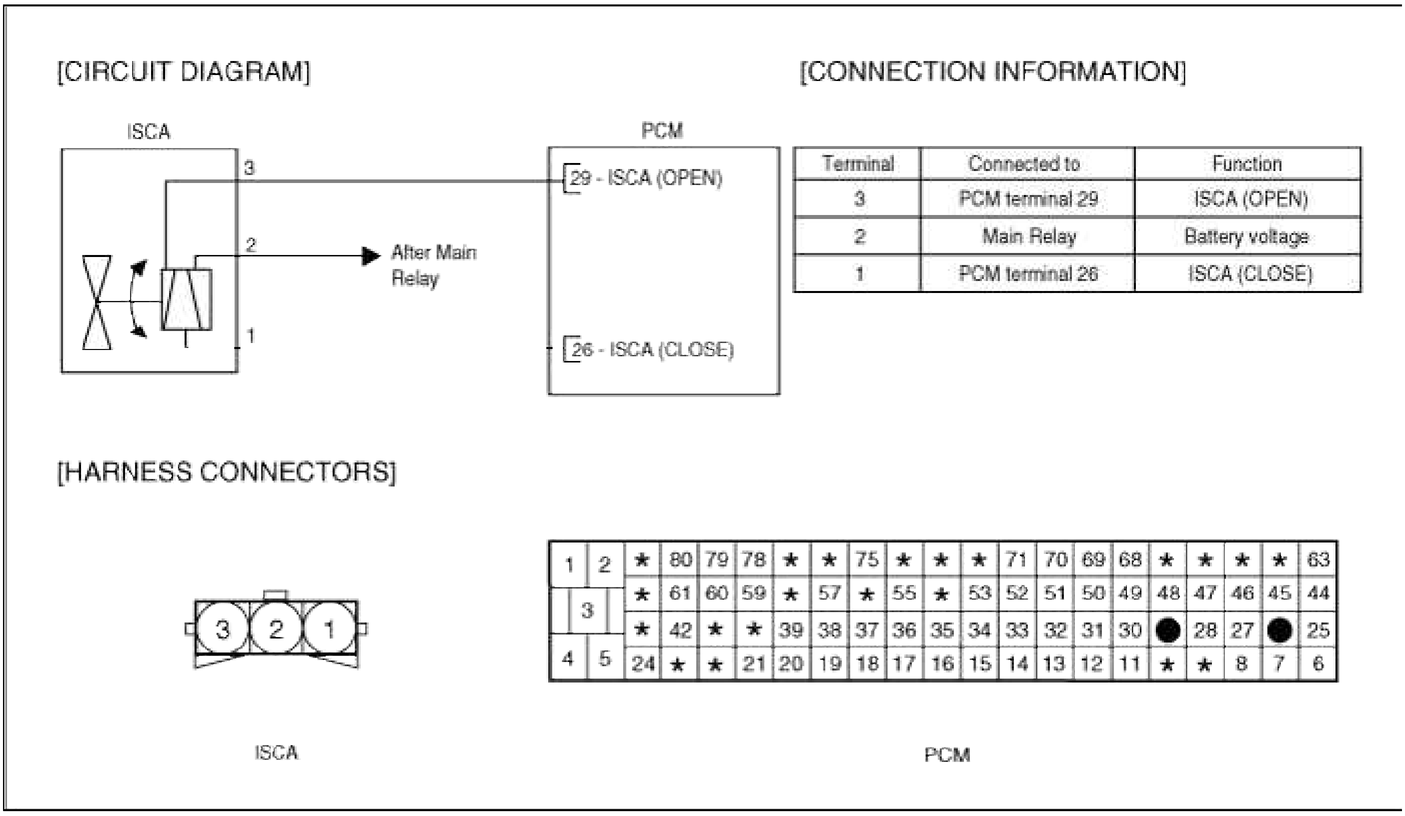
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM


[CIRCUIT DIAGRAM]
ISCA
3
2
1
After Main Relay
PCM
29 - ISCA (OPEN)
26 - ISCA (CLOSE)
[HARNESS CONNECTORS]
3 2 1
ISCA
PCM

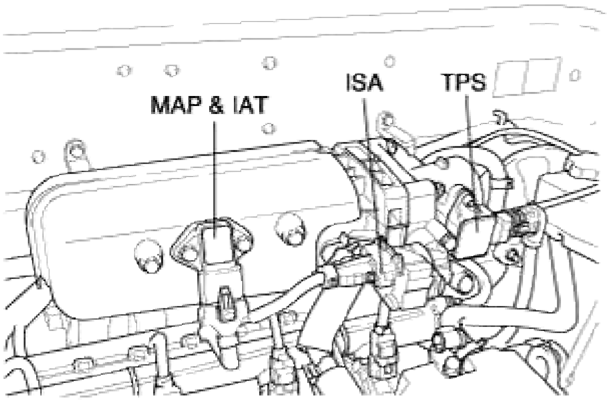
[CONNECTION INFORMATION]

Terminal	Connected to	Function
3	PCM terminal 29	ISCA (OPEN)
2	Main Relay	Battery voltage
1	PCM terminal 26	ISCA (CLOSE)

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	●	28	27	●	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P1506

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

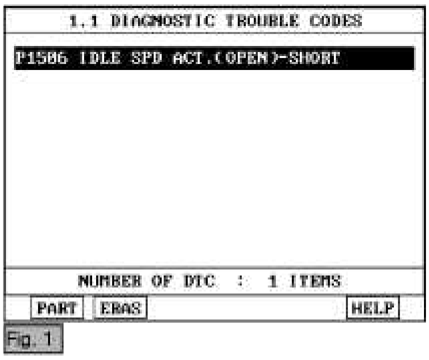
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuty check (opening coil)	● Short to battery in control circuit ● Faulty ISCA ● Faulty PCM
Threshold value	● Shorted to battery voltage	
Enable Conditions	● Shorted circuit	
Diagnostic Time	● Continous	
Fail Safe	● The limp home value of ISCA depends on engine speed and throttle angle. -PCM controls with mapping data.	

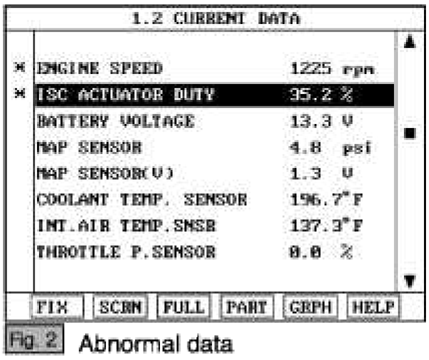
MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA signal" parameter on the scantool.



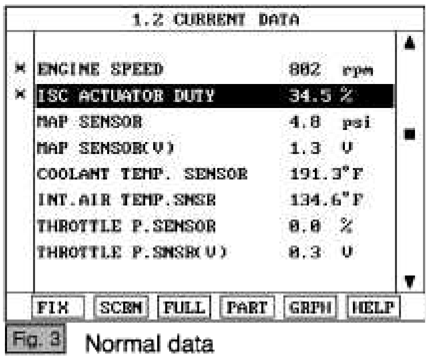
```
1.1 DIAGNOSTIC TROUBLE CODES
P1506 IDLE SPD ACT.(OPEN)-SHORT
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* ENGINE SPEED              1225 rpm
* ISC ACTUATOR DUTY         35.2 %
  BATTERY VOLTAGE           13.3 V
  MAP SENSOR                4.8  psi
  MAP SENSOR(V)             1.3  V
  COOLANT TEMP. SENSOR      196.7°F
  INT.AIR TEMP.SNSR         137.3°F
  THROTTLE P.SENSOR         0.0  %
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED              802  rpm
* ISC ACTUATOR DUTY         34.5 %
  MAP SENSOR                4.8  psi
  MAP SENSOR(V)             1.3  V
  COOLANT TEMP. SENSOR      191.3°F
  INT.AIR TEMP.SNSR         134.6°F
  THROTTLE P.SENSOR         0.0  %
  THROTTLE P.SNSR(V)        0.3  V
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
A/CON switch OFF : 25~45%
A/CON switch ON : 35~55%

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

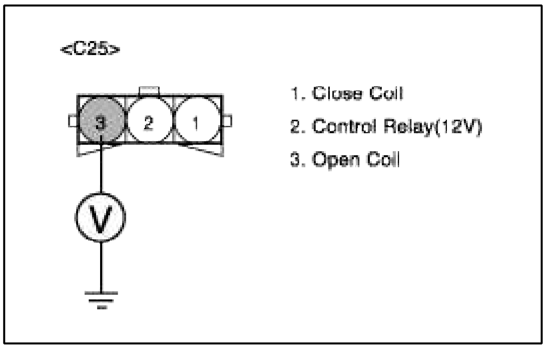
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

CONTROL CIRCUIT INSPECTION

1. Check for short between power and control harness
   (1) Ignition "OFF"
   (2) Disconnect ISCA sensor connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 3 of sensor harness connector and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

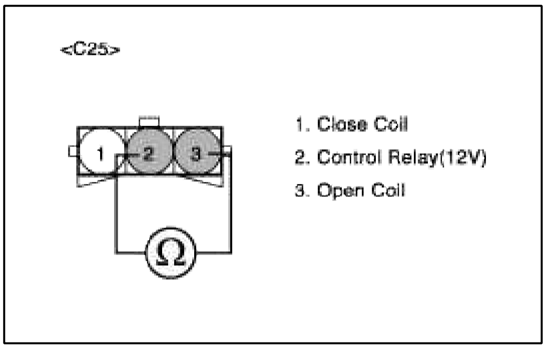
NO

Check for short to battery in control harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> NOTE
>
> In case,when the ISCA connector is disconnected,the voltage of ISCA terminal 3 is 12 V.
>
> Possible cause: Short circuit in battery power line after fuse (15A INJ).

COMPONENT INSPECTION

1. Check ISCA
   (1) Measure resistance between terminal 2 and 3 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good ISCA and check for proper operation. If the problem is corrected, replace ISCA and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

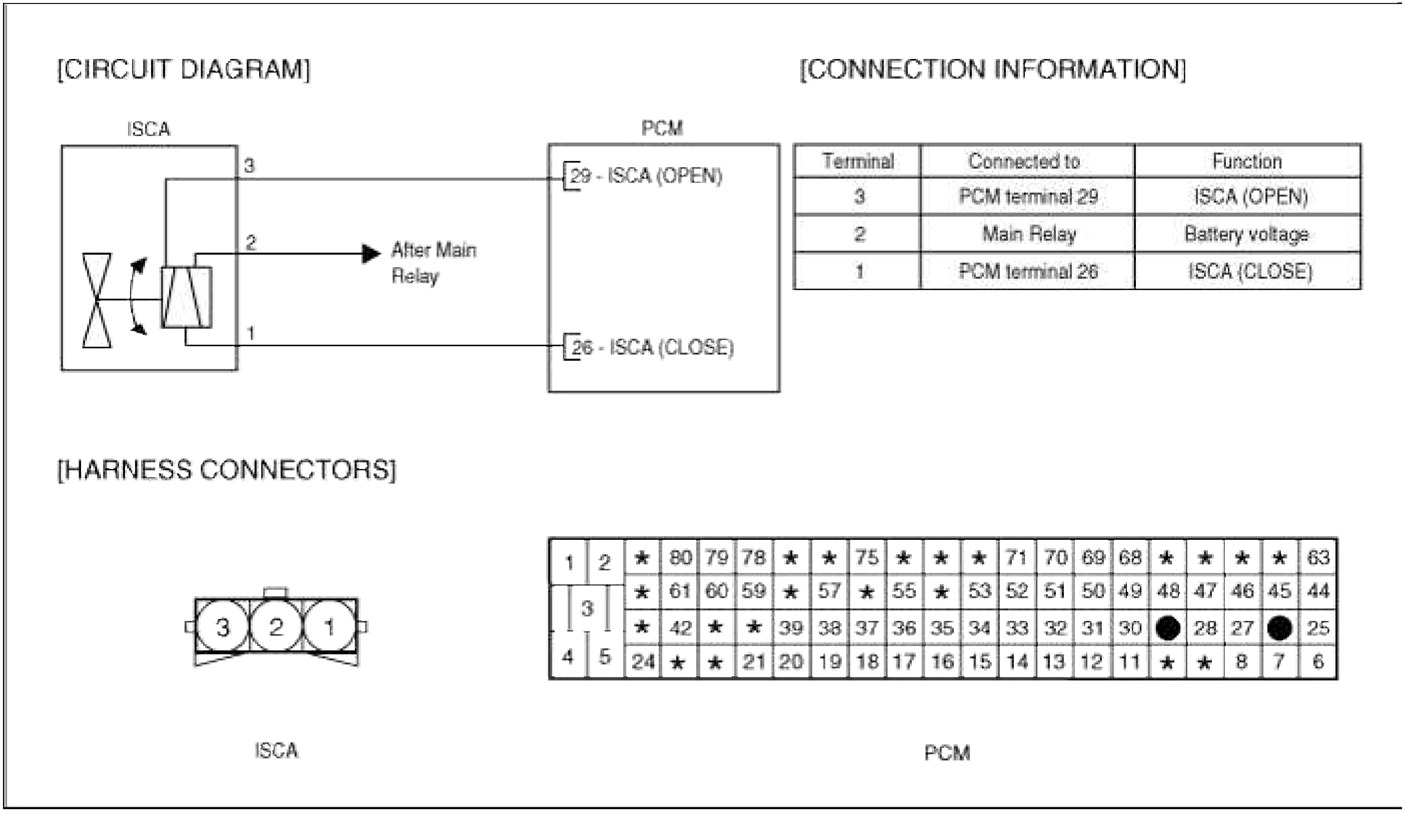
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

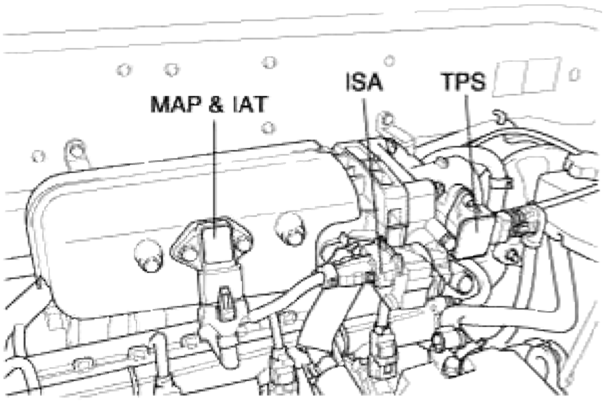

[CIRCUIT DIAGRAM]
ISCA
PCM
3
2
1
29 - ISCA (OPEN)
After Main Relay
26 - ISCA (CLOSE)
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
3
2
1
ISCA
PCM

Terminal	Connected to	Function
3	PCM terminal 29	ISCA (OPEN)
2	Main Relay	Battery voltage
1	PCM terminal 26	ISCA (CLOSE)

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	●	28	27	●	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P1507

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

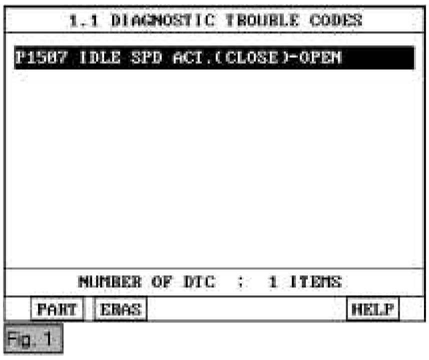
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy		● Open in battery circuit ● Open in control circuit ● Short to ground in control circuit ● Faulty ISCA ● Faulty PCM
Threshold value	● Shorted to GND / Disconnected	
Enable Conditions	● Open circuit	
Diagnostic Time	● Continous	
Fail Safe	● The limp home value of ISCA depends on engine speed and throttle angle. -PCM controls with mapping data.	

MONITOR DTC STATUS

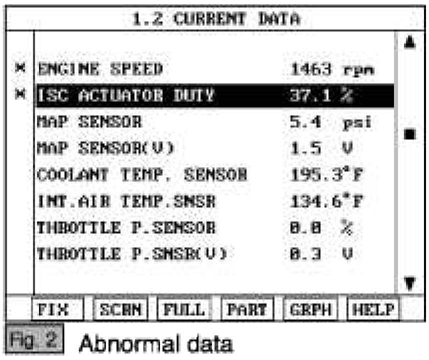
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA signal" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P1507 IDLE SPD ACT.(CLOSE)-OPEN

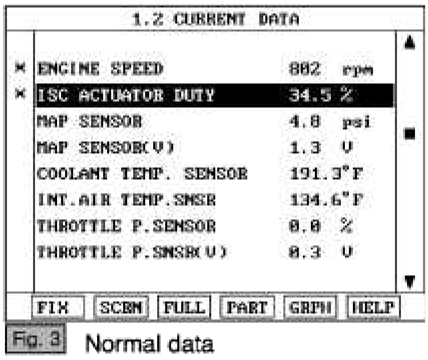
NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
* ENGINE SPEED            1463 rpm
* ISC ACTUATOR DUTY       37.1 %
  MAP SENSOR              5.4  psi
  MAP SENSOR(V)           1.5  V
  COOLANT TEMP. SENSOR    195.3°F
  INT.AIR TEMP.SMSR       134.6°F
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SMSR(V)      0.3  V
```

Fig. 2 Abnormal data



```
1.2 CURRENT DATA
* ENGINE SPEED            802  rpm
* ISC ACTUATOR DUTY       34.5 %
  MAP SENSOR              4.0  psi
  MAP SENSOR(V)           1.3  V
  COOLANT TEMP. SENSOR    191.3°F
  INT.AIR TEMP.SMSR       134.6°F
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SMSR(V)      0.3  V
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
A/CON switch OFF : 25~45%
A/CON switch ON : 35~55%

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

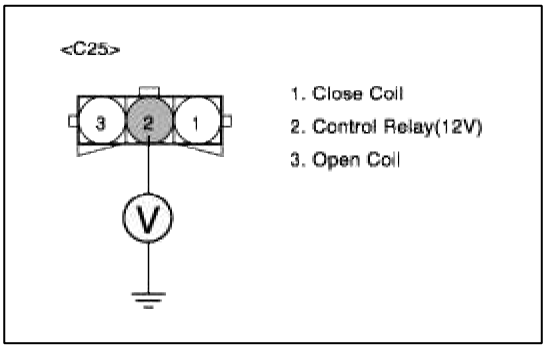
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect ISCA sensor connector.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 2 of sensor harness connector and chassis ground.



5. Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

Short circuit to chassis ground between ISCA harness connector and control relay.
Open circuit between ISCA harness connector and control relay.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

1. In case,when ISCA connector is disconnected, the voltage of ISCA terminal 2 is 0V.
   Possible cause: Open or short circuit in battery power line after fuse (15A INJ).
2. ECM also sets P1505 and P1507 if it detects the open circuit in ISCA power line.

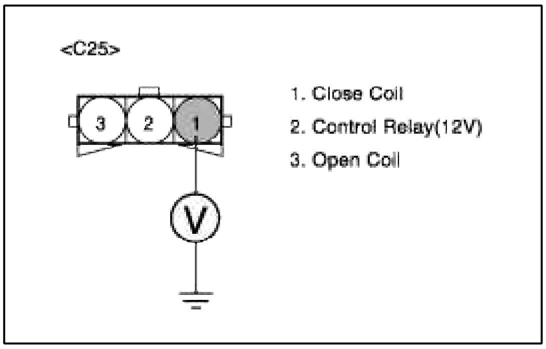
CONTROL CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"

   (2) Disconnect ISCA sensor connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure voltage between terminal 1 of sensor harness connector and chassis ground.



   (5) Is measure voltage within Specification?

YES

Go to "Check for short to ground in harness " as below.

NO

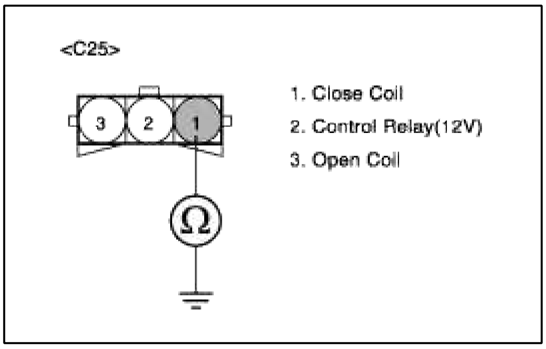
Open or Short circuit to chassis ground between ISCA harness connector and PCM harness connector. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for short to ground in harness
   (1) Ignition "OFF"

   (2) Disconnect ISCA sensor connector and PCM connector.

   (3) Ignition "ON" & Engine "OFF"

   (4) Measure resistance between terminal 1 of sensor harness connector and chassis ground.



   (5) Is measure resistance within Specification?

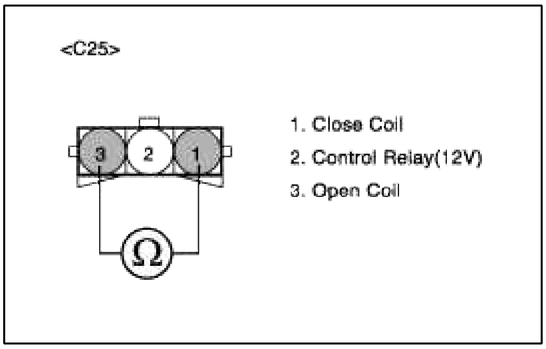
YES

Go to "Check for short between open coil and close coil harness " as below.

NO

Short circuit to chassis ground between ISCA harness connector and PCM harness connector. Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

3. Check for short between open coil and close coil harness
   (1) Ignition "OFF"
   (2) Disconnect ISCA sensor connector and PCM connector.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure resistance between terminal 1 and 3 of sensor harness connector.



   (5) Is measure resistance within Specification?

YES

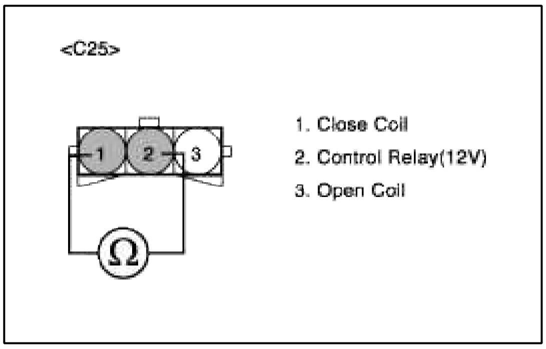
Go to "Component Inspection" procedure.

NO

Shorted circuit between ISCA open signal circuit and close signal circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check ISCA
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good ISCA and check for proper operation. If the problem is corrected, replace ISCA and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

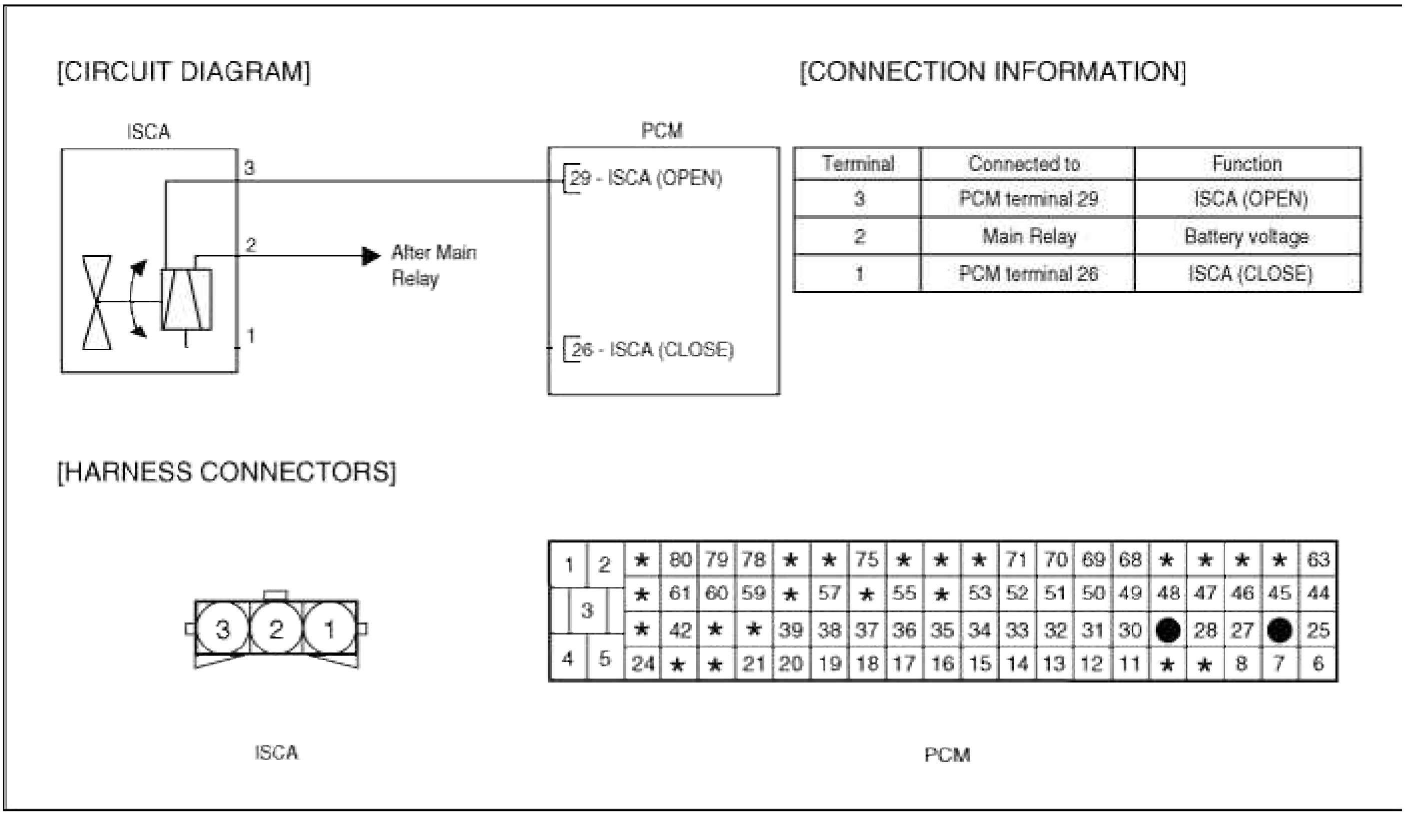
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

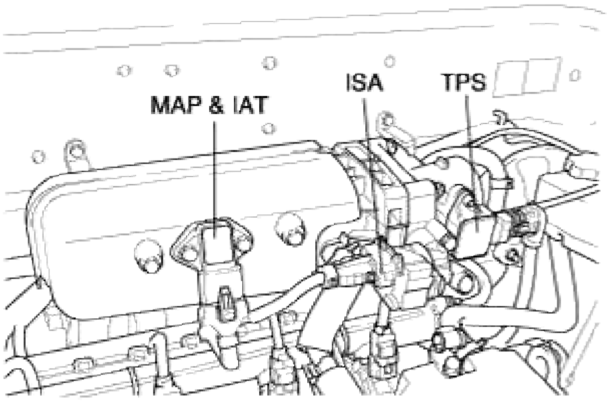

[CIRCUIT DIAGRAM]
ISCA
3
2
1
After Main Relay
PCM
29 - ISCA (OPEN)
26 - ISCA (CLOSE)
[HARNESS CONNECTORS]
3 2 1
ISCA
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 ● 28 27 ● 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

[CONNECTION INFORMATION]

Terminal	Connected to	Function
3	PCM terminal 29	ISCA (OPEN)
2	Main Relay	Battery voltage
1	PCM terminal 26	ISCA (CLOSE)

Fuel System > Troubleshooting > P1508

COMPONENT LOCATION


MAP & IAT
ISA
TPS

GENERAL DESCTIPTION

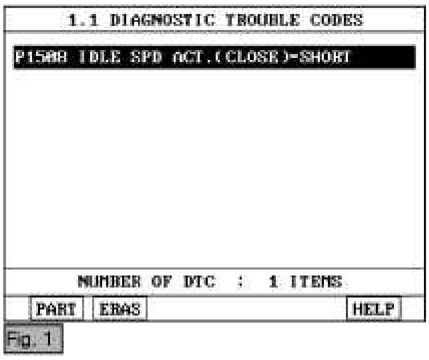
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuty check (opening coil)	● Short to battery in control circuit ● Faulty ISCA ● Faulty PCM
Threshold value	● Shorted to battery voltage	
Enable Conditions	● Shorted circuit	
Diagnostic Time	● Continous	
Fail Safe	● The limp home value of ISCA depends on engine speed and throttle angle. -PCM controls with mapping data.	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "ISCA signal" parameter on the scantool.

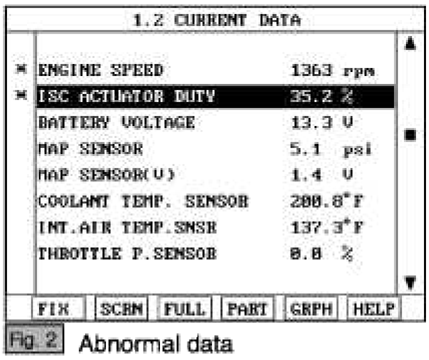


```
        1.1 DIAGNOSTIC TROUBLE CODES
P1500 IDLE SPD ACT.(CLOSE)-SHORT



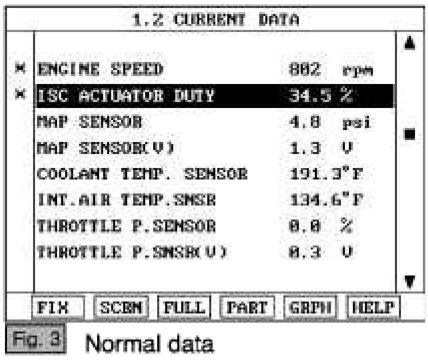

       NUMBER OF DTC  :  1 ITEMS
```

Fig. 1



```
            1.2 CURRENT DATA
* ENGINE SPEED            1363 rpm
* ISC ACTUATOR DUTY       35.2 %
  BATTERY VOLTAGE         13.3 V
  MAP SENSOR              5.1  psi
  MAP SENSOR(V)           1.4  V
  COOLANT TEMP. SENSOR    200.0°F
  INT.AIR TEMP.SNSR       137.3°F
  THROTTLE P.SENSOR       0.0  %
```

Fig. 2 Abnormal data



```
            1.2 CURRENT DATA
* ENGINE SPEED            802  rpm
* ISC ACTUATOR DUTY       34.5 %
  MAP SENSOR              4.8  psi
  MAP SENSOR(V)           1.3  V
  COOLANT TEMP. SENSOR    191.3°F
  INT.AIR TEMP.SNSR       134.6°F
  THROTTLE P.SENSOR       0.0  %
  THROTTLE P.SNSR(V)      0.3  V
```

Fig. 3 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard
A/CON switch OFF : 25~45%
A/CON switch ON : 35~55%

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.

2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

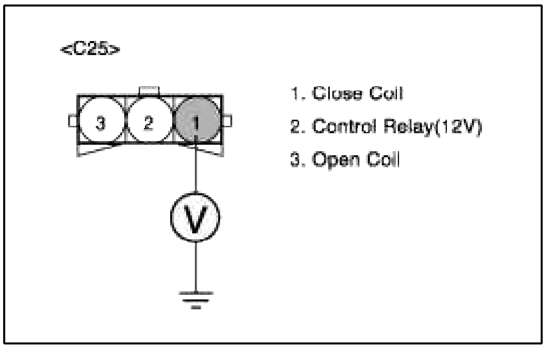
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit insepction" procedure.

CONTROL CIRCUIT INSPECTION

1. Check for short between power and control harness
   - (1) Ignition "OFF"
   - (2) Disconnect ISCA sensor connector.
   - (3) Ignition "ON" & Engine "OFF"
   - (4) Measure voltage between terminal 1 of sensor harness connector and chassis ground.



   - (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

Check for short to battery in control harness.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

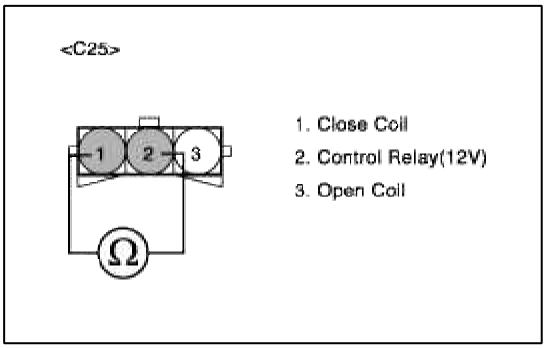
NOTE

In case,when the ISCA connector is disconnected,the voltage of ISCA terminal 3 is 12 V.

Possible cause: Short circuit in battery power line after fuse (15A INJ).

COMPONENT INSPECTION

1. Check ISCA
   (1) Measure resistance between terminal 1 and 2 of sensor connector(To sensor side)



   (2) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good ISCA and check for proper operation. If the problem is corrected, replace ISCA and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

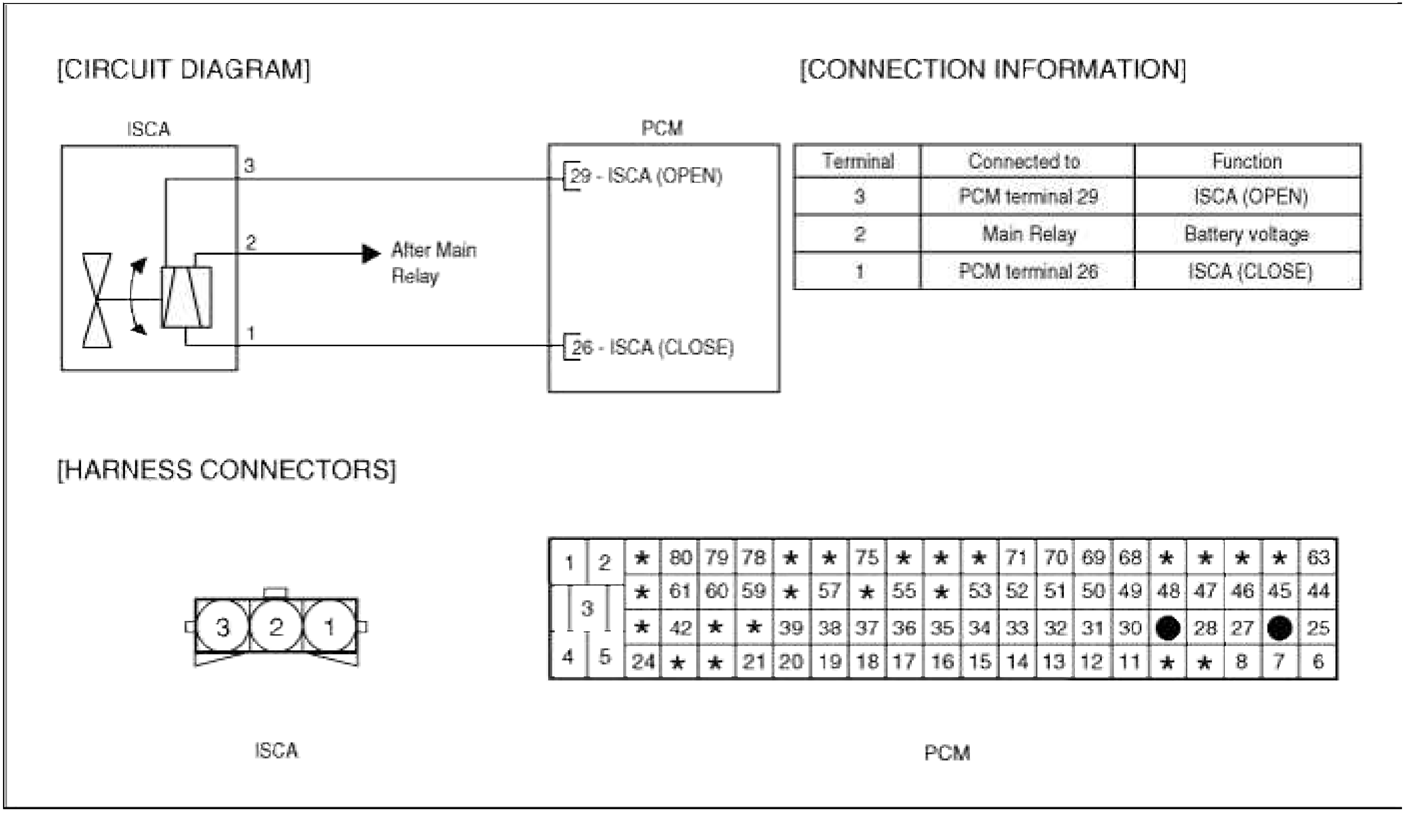
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

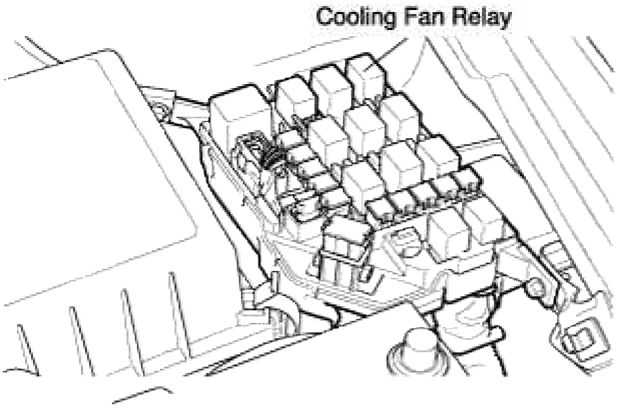

[CIRCUIT DIAGRAM]
ISCA
PCM
3
29 - ISCA (OPEN)
2
After Main Relay
1
26 - ISCA (CLOSE)
[CONNECTION INFORMATION]
[HARNESS CONNECTORS]
3
2
1
ISCA
PCM

Terminal	Connected to	Function
3	PCM terminal 29	ISCA (OPEN)
2	Main Relay	Battery voltage
1	PCM terminal 26	ISCA (CLOSE)

1	2	★	80	79	78	★	★	75	★	★	★	71	70	69	68	★	★	★	★	63
3		★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
		★	42	★	★	39	38	37	36	35	34	33	32	31	30	●	28	27	●	25
4	5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

Fuel System > Troubleshooting > P1624

COMPONENT LOCATION


Cooling Fan Relay

GENERAL DESCTIPTION

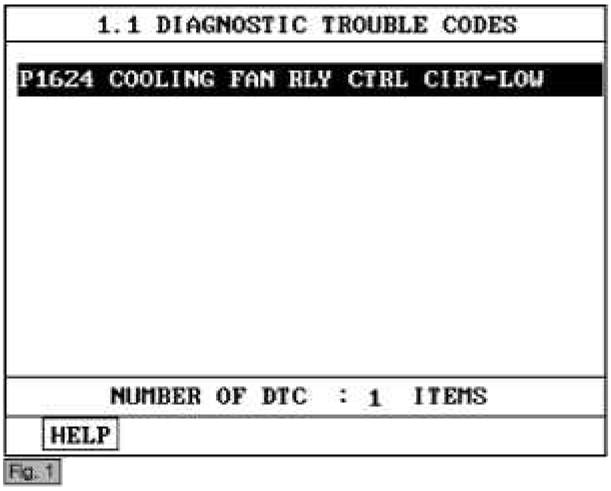
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check	● Open in battery and control circuit ● Short to ground in control circuit (pin 50 to GND) ● Faulty FAN Relay ● Faulty PCM
Threshold value	● Short to GND or disconnected	
Enable Conditions	● Cooling fan control enabled	
Diagnostic Time		
Fail Safe		

MONITOR DTC STATUS

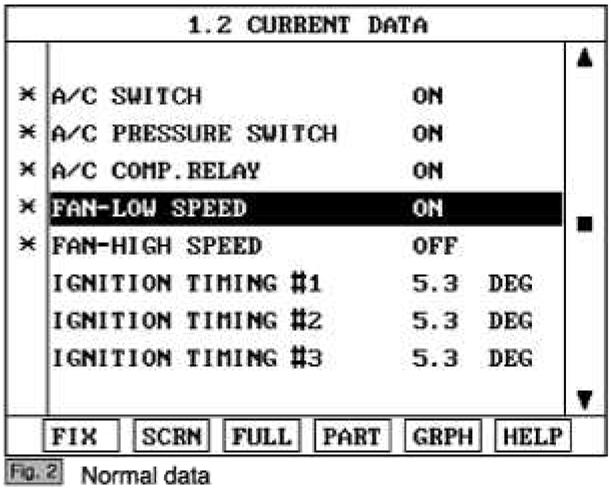
1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "COOLING FAN" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P1624 COOLING FAN RLY CTRL CIRT-LOW

NUMBER OF DTC : 1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA
× A/C SWITCH              ON
× A/C PRESSURE SWITCH     ON
× A/C COMP.RELAY          ON
× FAN-LOW SPEED           ON
× FAN-HIGH SPEED          OFF
  IGNITION TIMING #1      5.3  DEG
  IGNITION TIMING #2      5.3  DEG
  IGNITION TIMING #3      5.3  DEG
```

Fig. 2 Normal data

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power circuit inspection" procedure.

POWER CIRCUIT INSPECTION

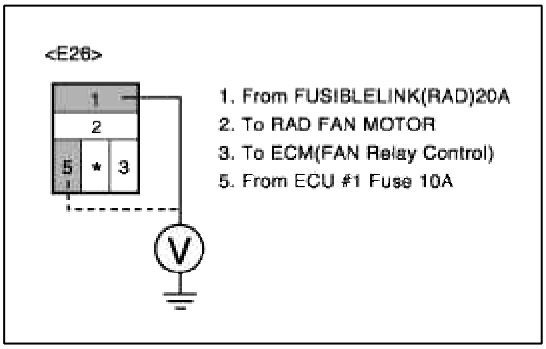
1. Check for open in harness

(1) Ignition "OFF"

(2) Disconnect RAD FAN Relay.

(3) Ignition "ON" & Engine "OFF"

(4) Measure voltage between terminal 1 and 5 of RAD FAN Relay harness connector and chassis ground.


<E26>
1
2
5
*
3
V
1. From FUSIBLELINK(RAD)20A
2. To RAD FAN MOTOR
3. To ECM(FAN Relay Control)
5. From ECU #1 Fuse 10A

(5) Is measure voltage within Specification?

YES

Go to "Control circuit insepction" procedure.

NO

Open circuit or short circuit to chassis ground between RAD FAN Relay harness connector and ECU #1 Fuse 10A.

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

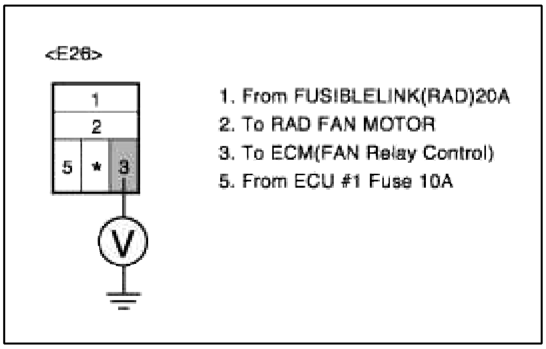
1. Check for short to ground in harness

(1) Ignition "OFF"

(2) Disconnect RAD FAN Relay.

(3) Ignition "ON" & Engine "OFF"

(4) Measure voltage between terminal 3 of RAD FAN Relay harness connector and chassis ground.


<E26>
1
2
5
*
3
V
1. From FUSIBLELINK(RAD)20A
2. To RAD FAN MOTOR
3. To ECM(FAN Relay Control)
5. From ECU #1 Fuse 10A

(5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

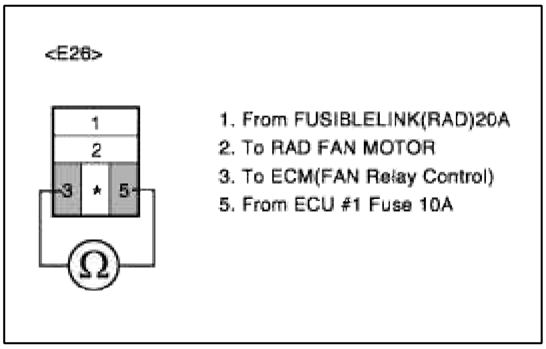
NO

Check for open or Short to ground in control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when RAD FAN Relay connector is disconnected,the voltage at terminal 3 is 0V.
> Possible cause : Short to ground in control circuit

COMPONENT INSPECTION

1. Check RAD FAN Relay
   (1) Ignition "OFF"
   (2) Disconnect RAD FAN Relay.
   (3) Measure resistance between terminal 3 and 5 of RAD FAN Relay connector(To sensor side)



(4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good RAD FAN Relay heater and check for proper operation. If the problem is corrected, replace RAD FAN Relay and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

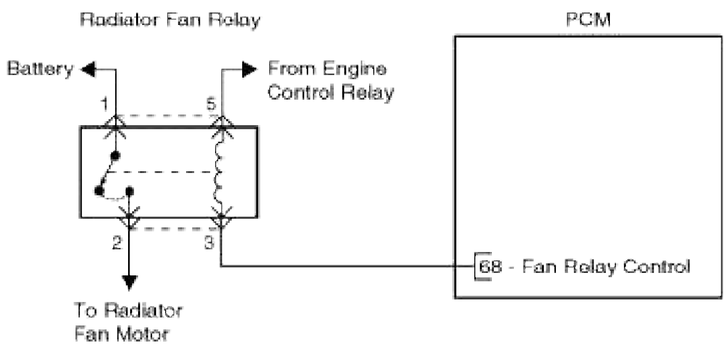
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

[CIRCUIT DIAGRAM]


Radiator Fan Relay
Battery
From Engine Control Relay
1
5
2
3
To Radiator Fan Motor
PCM
68 - Fan Relay Control

[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage
2	Radiator Fan Motor	Battery Voltage
3	PCM Terminal 68	Fan Relay Control
5	Battery	Battery Voltage

[HARNESS CONNECTORS]

1		
2		
5	★	3

Radiator Fan Relay

1 2	★	80	79	78	★	★	75	★	★	★	71	70	69	●	★	★	★	★	63
3	★	61	60	59	★	57	★	55	★	53	52	51	50	49	48	47	46	45	44
	★	42	★	★	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25
4 5	24	★	★	21	20	19	18	17	16	15	14	13	12	11	★	★	8	7	6

PCM

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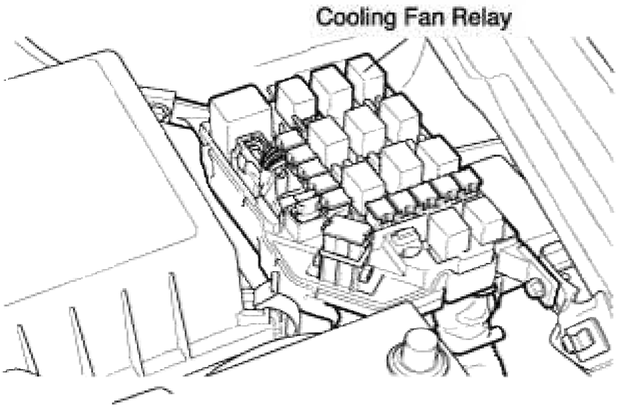
COMPONENT LOCATION


Cooling Fan Relay

GENERAL DESCTIPTION

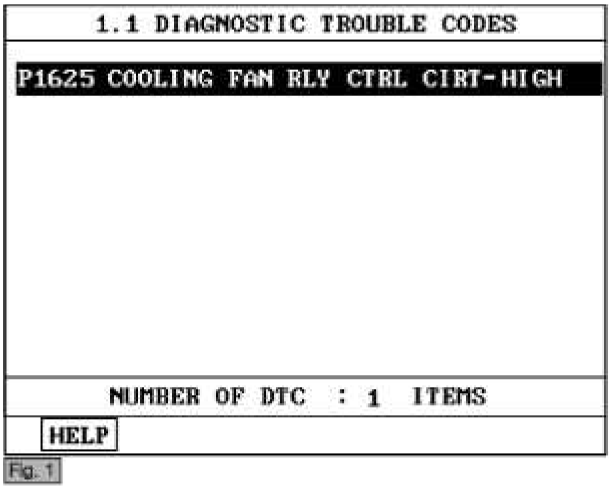
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check	● Short to battery in control circuit ● Faulty FAN Relay ● Faulty PCM
Threshold value	● Short to battery	
Enable Conditions	● Cooling fan control enabled	
Diagnostic Time	● Continuous	
Fail Safe	● Heater open loop control	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "COOLING FAN" parameter on the scantool.

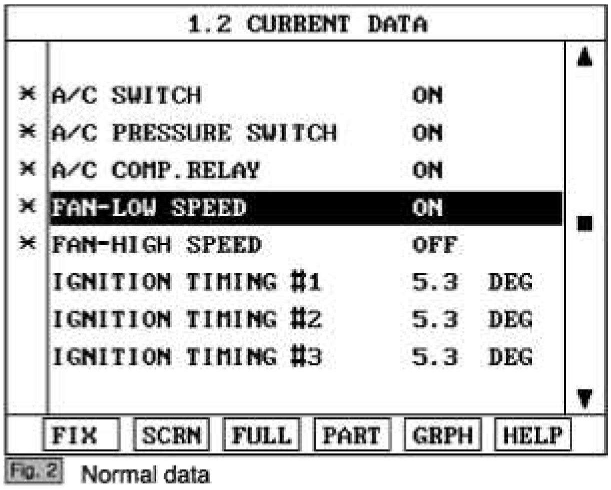


```
1.1 DIAGNOSTIC TROUBLE CODES

P1625 COOLING FAN RLY CTRL CIRT-HIGH

NUMBER OF DTC : 1 ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* A/C SWITCH              ON
* A/C PRESSURE SWITCH     ON
* A/C COMP.RELAY          ON
* FAN-LOW SPEED           ON
* FAN-HIGH SPEED          OFF
  IGNITION TIMING #1      5.3  DEG
  IGNITION TIMING #2      5.3  DEG
  IGNITION TIMING #3      5.3  DEG
```

Fig. 2 Normal data

Service standard

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.

3. Has a problem been found?

YES

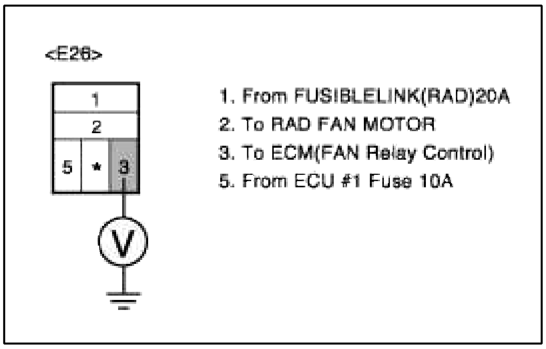
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Control circuit inspection" procedure.

CONTROL CIRCUIT INSPECTION

1. Check for short to ground in harness
   (1) Ignition "OFF"
   (2) Disconnect RAD FAN Relay.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 3 of RAD FAN Relay harness connector and chassis ground.



<E26>
1
2
5
*
3
V
1. From FUSIBLELINK(RAD)20A
2. To RAD FAN MOTOR
3. To ECM(FAN Relay Control)
5. From ECU #1 Fuse 10A

   (5) Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

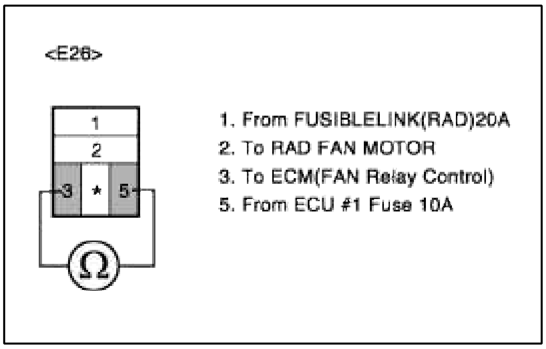
NO

Check for open or Short to ground in control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

> **NOTE**
>
> In case,when RAD FAN Relay connector is disconnected,the voltage at terminal 3 is 0V.
> Possible cause : Short to ground in control circuit

COMPONENT INSPECTION

1. Check RAD FAN Relay
   (1) Ignition "OFF"
   (2) Disconnect RAD FAN Relay.
   (3) Measure resistance between terminal 3 and 5 of RAD FAN Relay connector(To sensor side)



   (4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good RAD FAN Relay heater and check for proper operation. If the problem is corrected, replace RAD FAN Relay and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

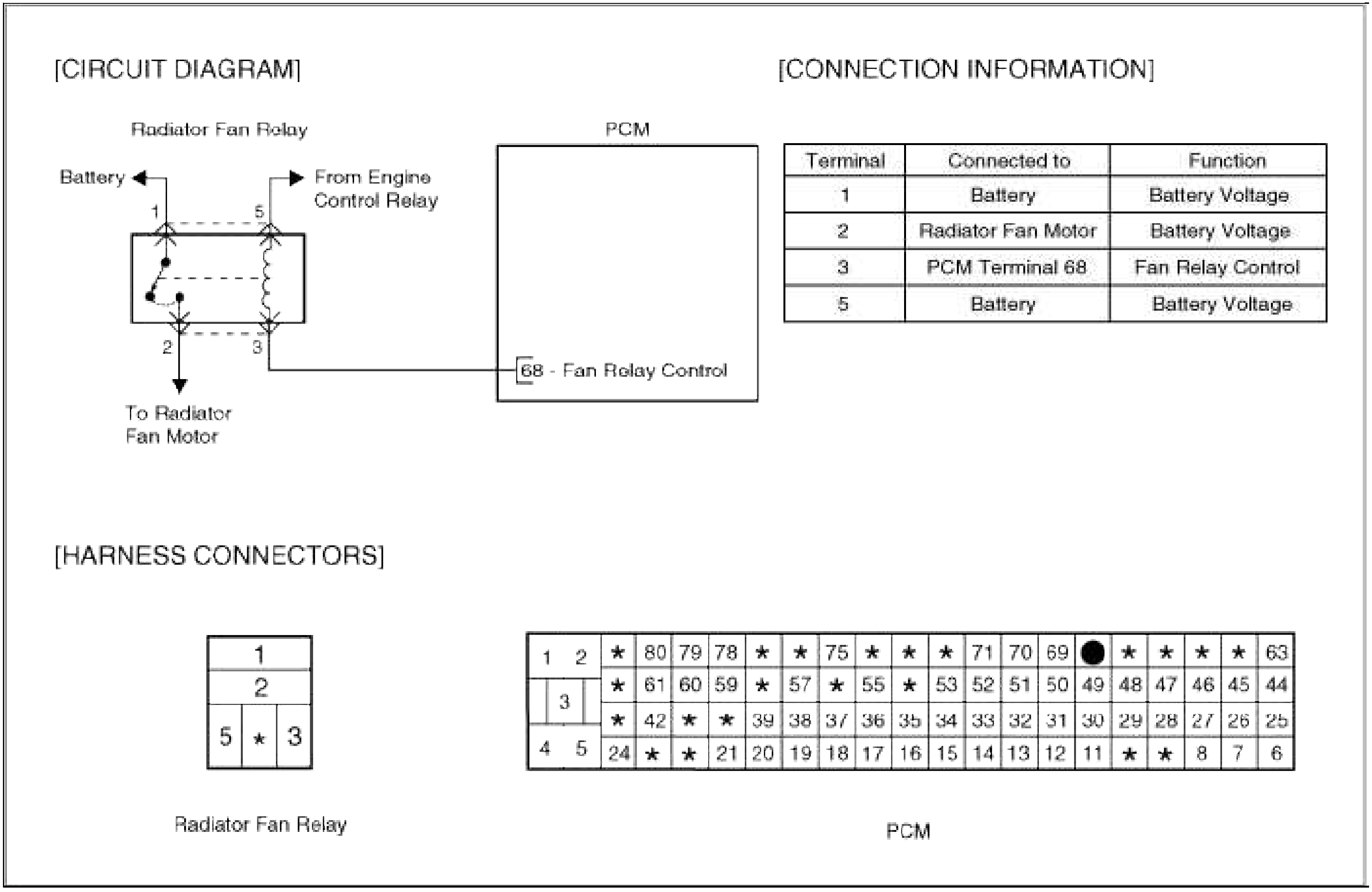
YES

Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM



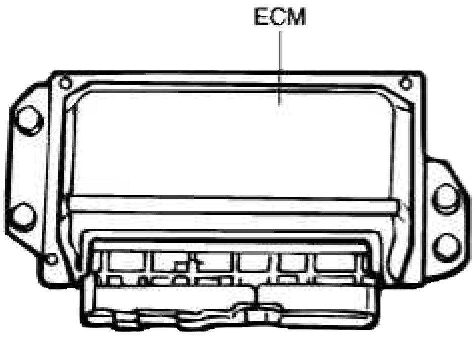
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage
2	Radiator Fan Motor	Battery Voltage
3	PCM Terminal 68	Fan Relay Control
5	Battery	Battery Voltage

[CIRCUIT DIAGRAM]
Radiator Fan Relay
Battery
From Engine Control Relay
1
5
2
3
To Radiator Fan Motor
PCM
68 - Fan Relay Control
[HARNESS CONNECTORS]
1
2
5 ★ 3
Radiator Fan Relay
1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 69 ● ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6
PCM

Fuel System > Troubleshooting > P1765

COMPONENT LOCATION



GENERAL DESCTIPTION

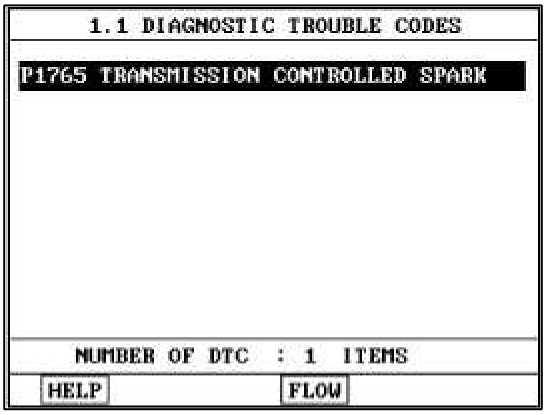
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Signal check	● Contact resistance in connectors ● Faulty PCM
Threshold value	● Duty cycle from TCU < 12.5 % or >99.6 %	
Enable Conditions	● Torque reduction status enabled	
Diagnostic Time	● 20 sec	
Fail Safe		

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor DTC(Diagnostics Trouble Code) on the scantool.



1.1 DIAGNOSTIC TROUBLE CODES

P1765 TRANSMISSION CONTROLLED SPARK

NUMBER OF DTC : 1 ITEMS

4. Is the same DTC displayed again?

YES

Go to "W/Harness Inspection" procedure

NO

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to ""Component Inspection" procedure.

COMPONENT INSPECTION

1. Check PCM

   Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

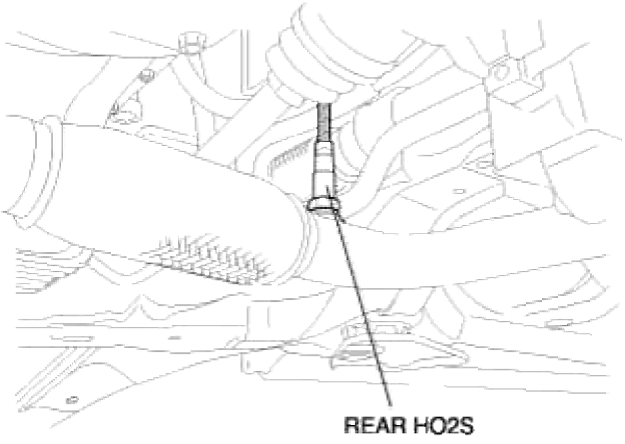
NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

Fuel System > Troubleshooting > P2096

COMPONENT LOCATION



GENERAL DESCTIPTION

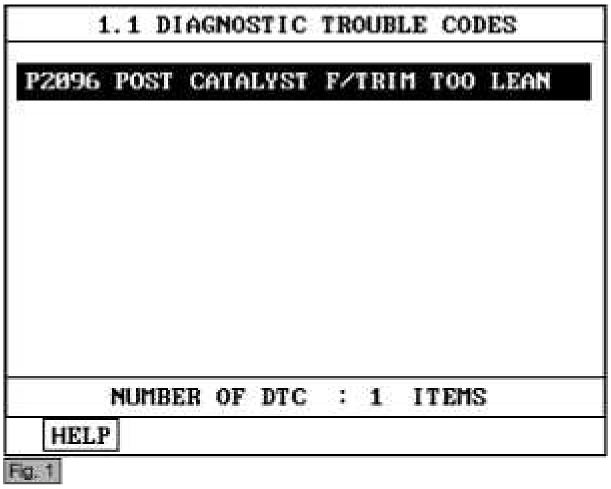
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	● Shift rate	● Contact resistance in connections. ● Exhaust System ● Faulty Catalytic converter ● Faulty HO2S(B1/S2) ● Faulty PCM
Enable Conditions	● Engine speed 1600-3000 rpm ● Engine load 25-75 %	
Threshold Value	● The second controller by downstream O2 sensor> 1.2 s	
Diagnostic Time		

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the HO2S(B1/S2) parameter on the scantool.

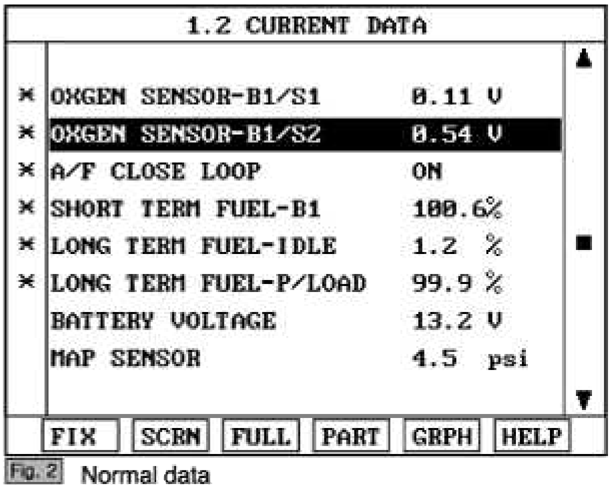


```
1.1 DIAGNOSTIC TROUBLE CODES

P2096 POST CATALYST F/TRIM TOO LEAN

NUMBER OF DTC  : 1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

× OXGEN SENSOR-B1/S1       0.11 V
× OXGEN SENSOR-B1/S2       0.54 V
× A/F CLOSE LOOP           ON
× SHORT TERM FUEL-B1       100.6%
× LONG TERM FUEL-IDLE      1.2  %
× LONG TERM FUEL-P/LOAD    99.9 %
  BATTERY VOLTAGE          13.2 V
  MAP SENSOR               4.5  psi
```

Fig. 2 Normal data

4. Is the same DTC displayed again?

YES

Go to "W/Harness Inspection" procedure

NO

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Check Exhaust System Inspection
   (1) Visually/physically inspect the following conditions:
   Exhaust system between HO2S(B1/S2) and Three way catalyst for air leakage
   Damage, and for loose or missing hardware:

   (2) Was a problem found in any of the above areas?

   YES

   Repair as necessary and go to "Verification of vehicle Repair" procedure

   NO

   Go to "Component Inspection" procedure

COMPONENT INSPECTION

1. Check HO2S(B1/S1)
   (1) Ignition "OFF"

   (2) Remove HO2S(B1/S1)

   (3) Visually/physically inspect following items:
   Inspect the HO2S(B1/S1) for any silicon contamination. This contamination will be indicated by a white powdery coating and this will result in a but false voltage signal
   If contamination is evident on the HO2S(B1/S1), replace contaminated sensor

   (4) Was a problem found in any of the above areas?

   YES

   Repair as necessary and go to "Verification of vehicle Repair" procedure

   NO

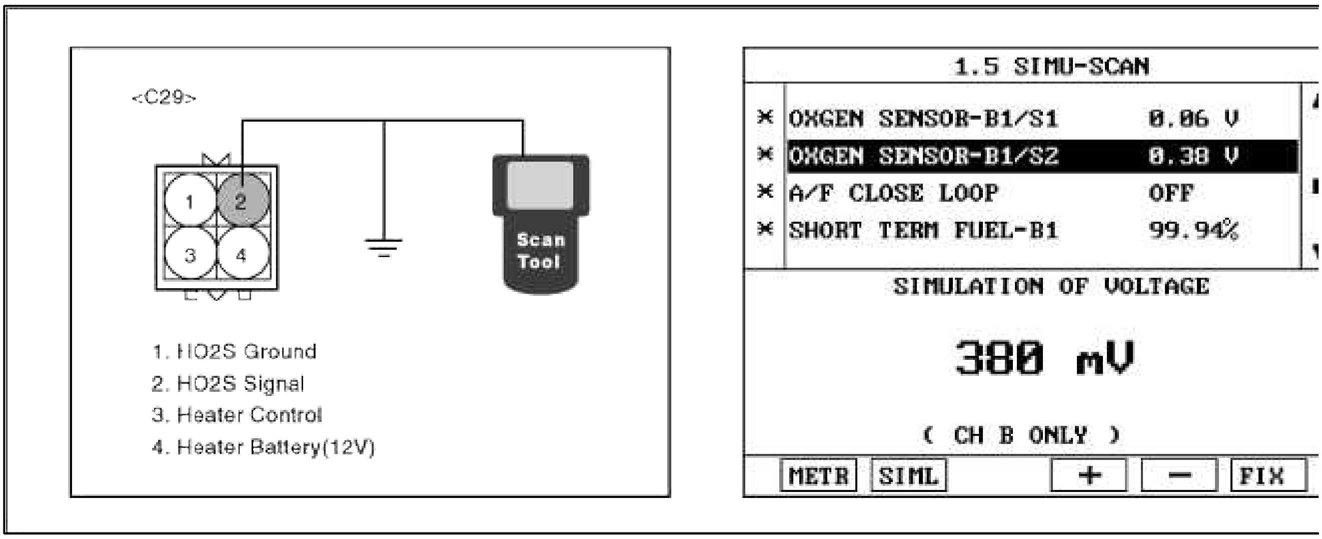
   Go to "Check PCM" as below

2. Check PCM
   (1) Ignition "OFF"

   (2) Connect Scantool and Engine "ON "

   (3) Select simulation function on scantool.

   (4) Simulate voltage at terminal 2 of HO2S(B1/S2) sensor signal connector.



```
1.5 SIMU-SCAN
* OXGEN SENSOR-B1/S1      0.06 V
* OXGEN SENSOR-B1/S2      0.38 V
* A/F CLOSE LOOP          OFF
* SHORT TERM FUEL-B1      99.94%
SIMULATION OF VOLTAGE
380 mV
( CH B ONLY )
```

(5) Is HO2S(B1/S2) signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deteriorati damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace I and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

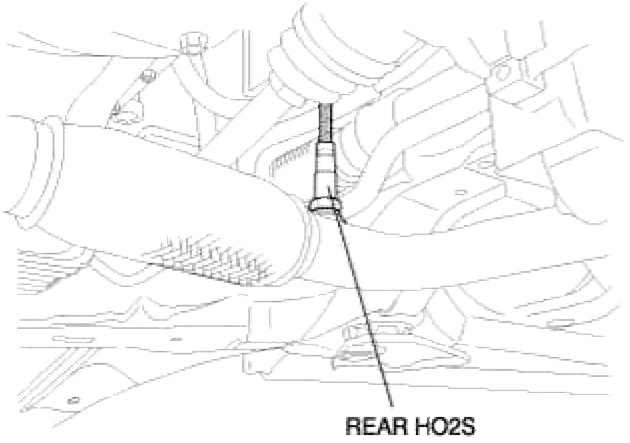
NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

Fuel System > Troubleshooting > P2097

COMPONENT LOCATION



GENERAL DESCTIPTION

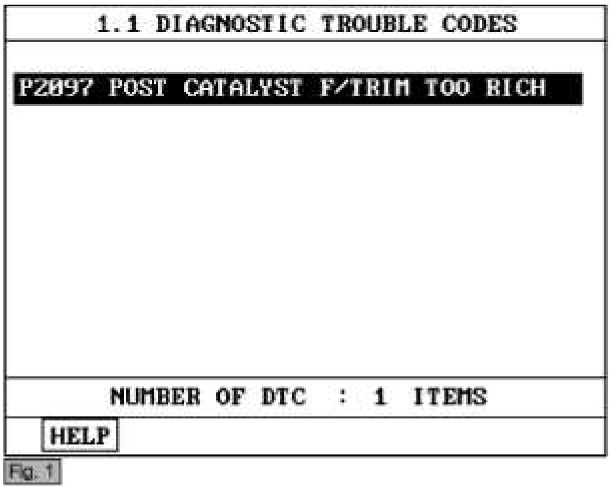
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible Cause
DTC Strategy	● Shift rate	● Contact resistance in connections. ● Exhaust System ● Faulty Catalytic converter ● Faulty HO2S(B1/S2) ● Faulty PCM
Enable Conditions	● Engine speed 1600-3000 rpm ● Engine load 25-75 %	
Threshold Value	● Second lambda controller from downstream lambda control < -1.2 s	
Diagnostic Time		

MONITOR SCANTOOL DATA

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the HO2S(B1/S2) parameter on the scantool.

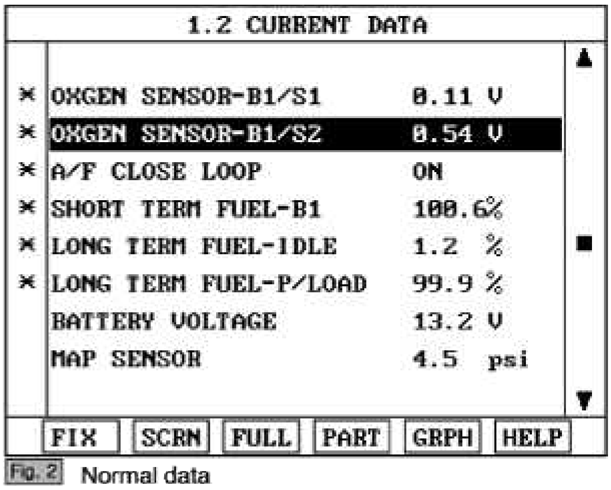


```
1.1 DIAGNOSTIC TROUBLE CODES

P2097 POST CATALYST F/TRIM TOO RICH

NUMBER OF DTC  :  1  ITEMS
```

Fig. 1



```
1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1      0.11 V
* OXGEN SENSOR-B1/S2      0.54 V
* A/F CLOSE LOOP          ON
* SHORT TERM FUEL-B1      100.6%
* LONG TERM FUEL-IDLE     1.2  %
* LONG TERM FUEL-P/LOAD   99.9 %
  BATTERY VOLTAGE         13.2 V
  MAP SENSOR              4.5  psi
```

Fig. 2 Normal data

4. Is the same DTC displayed again?

YES

Go to "W/Harness Inspection" procedure

NO

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Check Exhaust System Inspection
    (1) Visually/physically inspect the following conditions:
        Exhaust system between HO2S(B1/S2) and Three way catalyst for air leakage
        Damage, and for loose or missing hardware:
    (2) Was a problem found in any of the above areas?

YES

Repair as necessary and go to "Verification of vehicle Repair" procedure

NO

Go to "Component Inspection" procedure

COMPONENT INSPECTION

1. Check HO2S(B1/S1)
    (1) Ignition "OFF"
    (2) Remove HO2S(B1/S1)
    (3) Visually/physically inspect following items:
        Inspect the HO2S(B1/S1) for any silicon contamination. This contamination will be indicated by a white powdery coating and this will result in a but false voltage signal
        If contamination is evident on the HO2S(B1/S1), replace contaminated sensor
    (4) Was a problem found in any of the above areas?

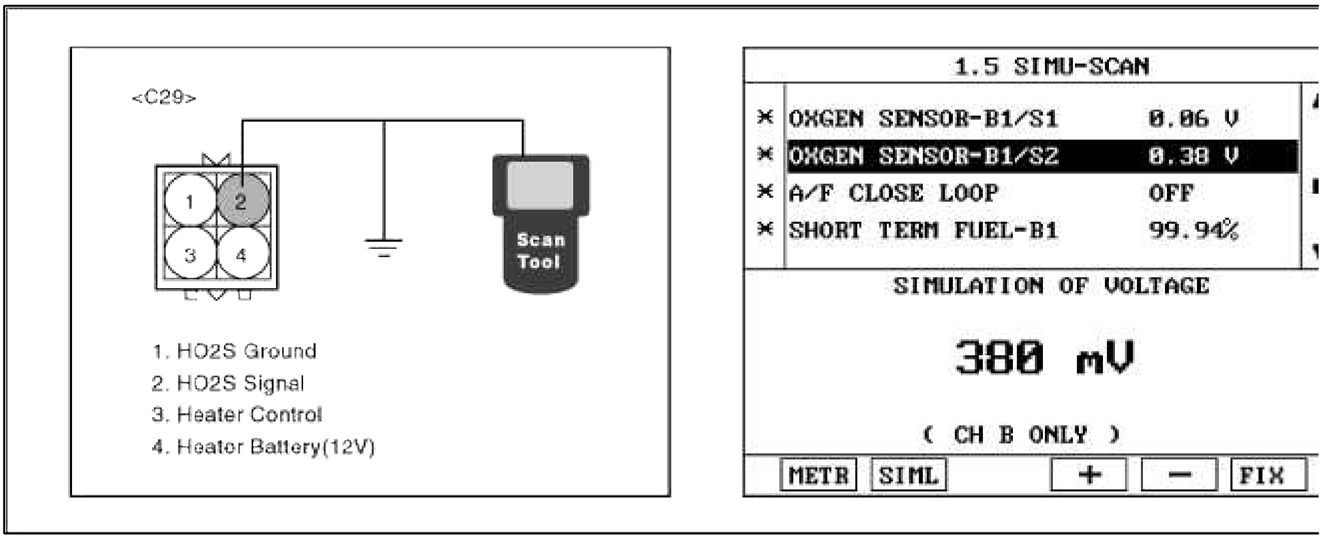
YES

Repair as necessary and go to "Verification of vehicle Repair" procedure

NO

Go to "Check PCM" as below

2. Check PCM
    (1) Ignition "OFF"
    (2) Connect Scantool and Engine "ON "
    (3) Select simulation function on scantool.
    (4) Simulate voltage at terminal 2 of HO2S(B1/S2) sensor signal connector.



```
1.5 SIMU-SCAN
* OXGEN SENSOR-B1/S1      0.06 V
* OXGEN SENSOR-B1/S2      0.38 V
* A/F CLOSE LOOP          OFF
* SHORT TERM FUEL-B1      99.94%
SIMULATION OF VOLTAGE
380 mV
( CH B ONLY )
```

(5) Is HO2S(B1/S2) signal value changed according to simulation voltage ?

YES

Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deteriorati damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

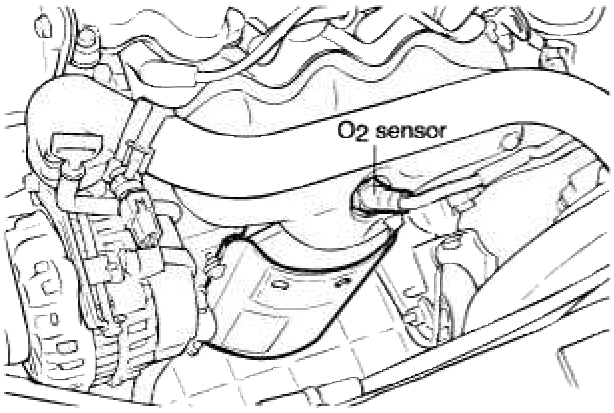
NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

Fuel System > Troubleshooting > P2187

COMPONENT LOCATION



GENERAL DESCTIPTION

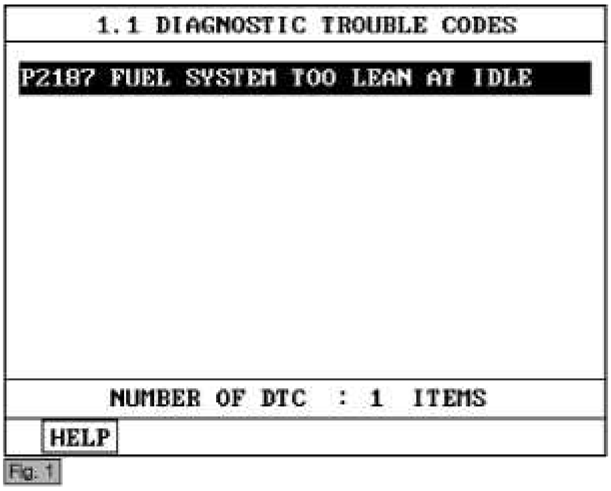
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Fuel trim limit	● Faulty ignition system. ● EVAP PCSV malfunction. ● Faulty fuel injectors. ● Leak in exhaust system. ● Faulty MAP,TPS,ECTS. ● Faulty front HO2S. ● Faulty PCM
Threshold value	● Additive long term value : > 10%	
Enable Conditions	● Coolant temperature > 70 degC(158 °F) ● Intake air temperature < 80 degC(176 °F) ● Throttle angle < 60 % ● Integrated air mass > 10 grams ● Closed loop control enabled ● No transient control phase ● No canister purge phase ● Air mass < 24 kg/h	
Diagnostic Time	● 30 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "FR HO2S signal" parameter on the scantool.
   Service standard
   For front HO2S
   -When decelerating suddeniy from 4000rpm : 200mV or less
   -When engine is suddenly raced : 600~1000mV
   -1500rpm : The fluctuation between 400mV or less and 600~1000mV

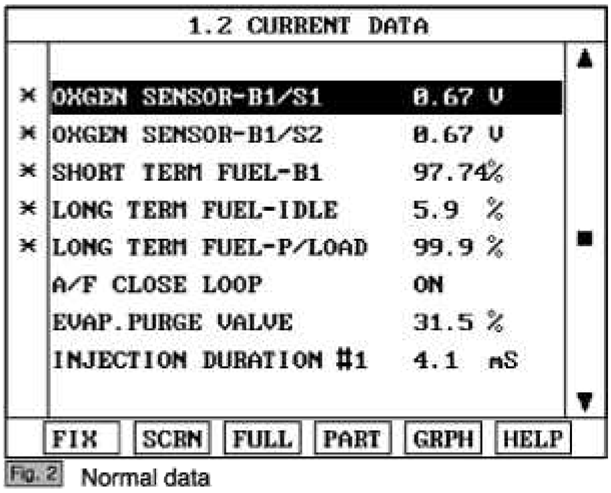


1.1 DIAGNOSTIC TROUBLE CODES

P2187 FUEL SYSTEM TOO LEAN AT IDLE

NUMBER OF DTC : 1 ITEMS

Fig. 1



1.2 CURRENT DATA

```
× OXGEN SENSOR-B1/S1        0.67 V
× OXGEN SENSOR-B1/S2        0.67 V
× SHORT TERM FUEL-B1        97.74%
× LONG TERM FUEL-IDLE       5.9  %
× LONG TERM FUEL-P/LOAD     99.9 %
  A/F CLOSE LOOP            ON
  EVAP.PURGE VALVE          31.5 %
  INJECTION DURATION #1     4.1  mS
```

Fig. 2 Normal data

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor’s and/or PCM’s connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

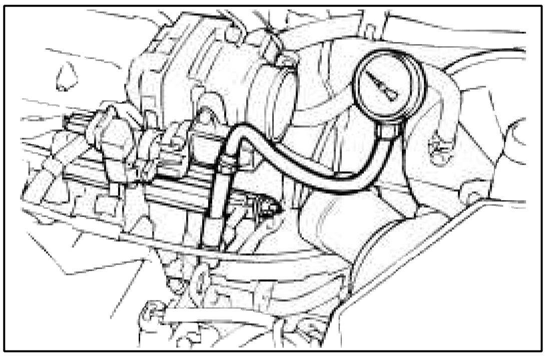
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Check for fuel pressure
   (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.
   (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.
   (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.
   (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.
   (5) Start an engine and warm up to operating temperature.
   (6) Check for fuel pressure at idle.



   (7) Is fuel pressure within specification?

YES

Go to "Check for Exhaust system " as below.

NO

Check fuel delivery system.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for Exhaust system
   (1) Check exhaust system for leaks, cracks, loose connection.(especially exhaust manifold, catalyst around rear HO2S, etc)
   (2) Is exhaust system okay?

YES

Go to "Check for Intake system"as below.

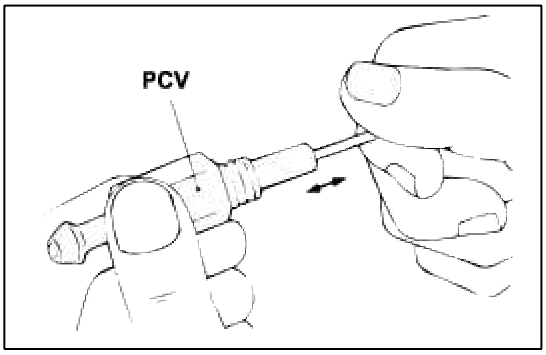
NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for vacuum and PCV

   Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation.
   (1) Remove the positive crankcase ventilation valve.
   (2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.
   (3) If the plunger does not move,the positive crankcase ventilation valve is clogged.Clean or replace it.



   (4) Are vacuum hoses and PCV OK?

YES

Go to "Check for spark plug" as below.

NO

Replace faulty vacuum hoses or PCV.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for spark plug

   Check the following items below for spark plug.
   (1) Remove spark plugs and check gap and plug condition.
   (2) Check the electrode condition(wear or carbon deposit)
   (3) Check the insulators condition(crack,etc)
   (4) Check the carbon deposit
   (5) Are spark plugs gapped properly and in good condition?

YES

Go to "Check for Fuel injector " as below.

NO

Fauity spark plugs.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

3. Check for Fuel injector
   (1) Check for fuel injector operation.
   (2) Are fuel injectors working normal and dispensing proper volume?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

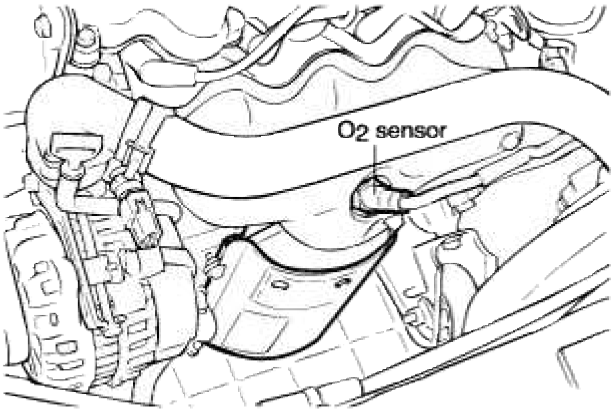
NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

Fuel System > Troubleshooting > P2188

COMPONENT LOCATION



GENERAL DESCTIPTION

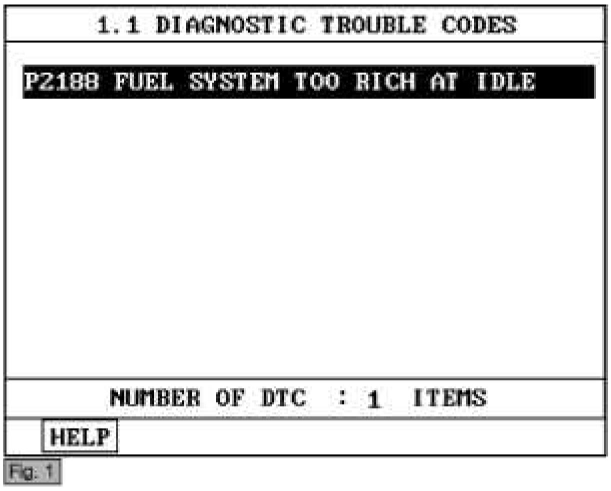
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Fuel trim limit	● Faulty ignition system. ● EVAP PCSV malfunction. ● Faulty fuel injectors. ● Leak in exhaust system. ● Faulty MAP,TPS,ECTS. ● Faulty front HO2S. ● Faulty PCM
Threshold value	● Additive long term value : < -10%	
Enable Conditions	● Coolant temperature > 70 degC(158 °F) ● Intake air temperature < 80 degC(176 °F) ● Throttle angle < 60 % ● Integrated air mass > 10 grams ● Closed loop control enabled ● No transient control phase ● No canister purge phase ● Engine speed < 920 rpm	
Diagnostic Time	● 30 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "FR HO2S signal" parameter on the scantool.

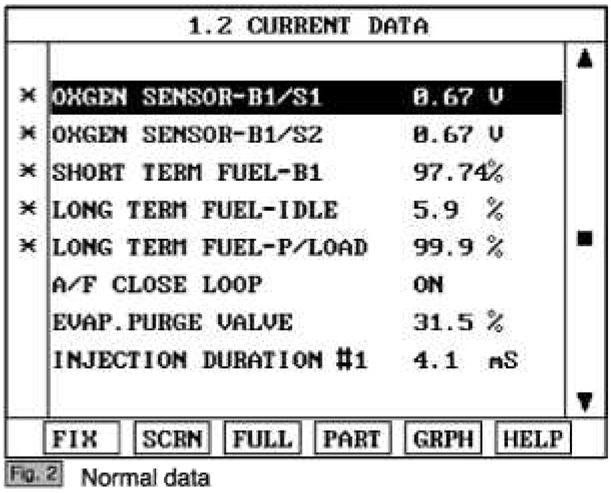


1.1 DIAGNOSTIC TROUBLE CODES

P2188 FUEL SYSTEM TOO RICH AT IDLE

NUMBER OF DTC : 1 ITEMS

Fig. 1



1.2 CURRENT DATA

×	OXGEN SENSOR-B1/S1	0.67 V
×	OXGEN SENSOR-B1/S2	0.67 V
×	SHORT TERM FUEL-B1	97.74%
×	LONG TERM FUEL-IDLE	5.9 %
×	LONG TERM FUEL-P/LOAD	99.9 %
	A/F CLOSE LOOP	ON
	EVAP.PURGE VALVE	31.5 %
	INJECTION DURATION #1	4.1 mS

Fig. 2 Normal data

Service standard

For front HO2S

-When decelerating suddeniy from 4000rpm : 200mV or less

-When engine is suddenly raced : 600~1000mV

-1500rpm : The fluctuation between 400mV or less and 600~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

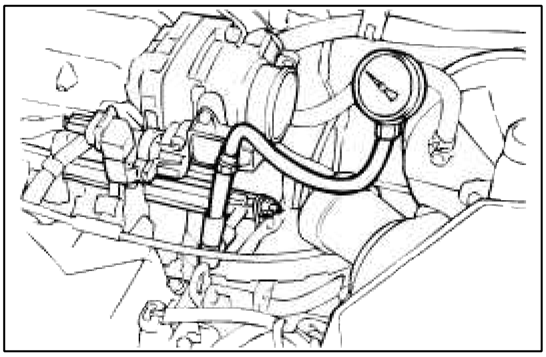
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Check for fuel pressure
   (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.
   (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.
   (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.
   (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.
   (5) Start an engine and warm up to operating temperature.
   (6) Check for fuel pressure at idle.



   (7) Is fuel pressure within specification?

YES

Go to "Check for Exhaust system " as below.

NO

Check fuel delivery system.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for Exhaust system
   (1) Check exhaust system for leaks, cracks, loose connection.(especially exhaust manifold, catalyst around rear HO2S, etc)

   (2) Is exhaust system okay?

   YES

   Go to "Check for Intake system"as below.

   NO

   Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

3. Check for Intake system
   Check intake system for leaks, cracks, loose connection as follwing items :
   (1) Throttle body gasket.

   (2) Gasket between intake manifold and surge tank.

   (3) Seals between intake manifold and fuel injectors.

   (4) Seals between surge tank and PCV valves..

   (5) Is intake system OK?

   YES

   Go to "Component Inspection" procedure.

   NO

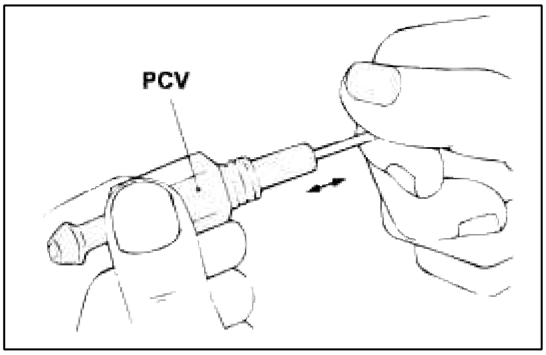
   Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for vacuum and PCV
   Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation.
   (1) Remove the positive crankcase ventilation valve.

   (2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.

   (3) If the plunger does not move,the positive crankcase ventilation valve is clogged.Clean or replace it.



   (4) Are vacuum hoses and PCV OK?

   YES

   Go to "Check for spark plug" as below.

   NO

   Replace faulty vacuum hoses or PCV.
   Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for Fuel injector
    (1) Check for fuel injector operation.
    (2) Are fuel injectors working normal and dispensing proper volume?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

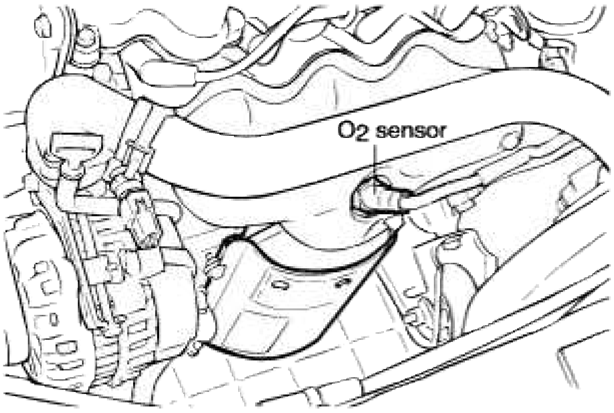
NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

Fuel System > Troubleshooting > P2191

COMPONENT LOCATION



GENERAL DESCTIPTION

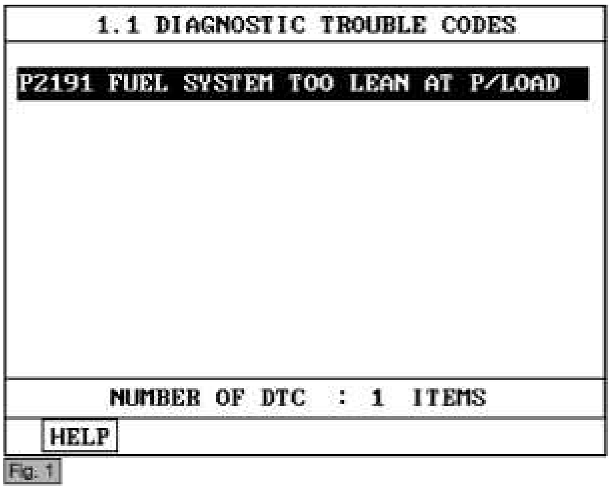
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Fuel trim limit	● Faulty ignition system. ● EVAP PCSV malfunction. ● Faulty fuel injectors. ● Leak in exhaust system. ● Faulty MAP,TPS,ECTS. ● Faulty front HO2S. ● Faulty PCM
Threshold value	● Multiplicative long term value 1,2 : > 1.23	
Enable Conditions	● Coolant temperature > 70 degC(158 °F) ● Intake air temperature < 80 degC(176 °F) ● Throttle angle < 60 % ● Integrated air mass > 10 grams ● Closed loop control enabled ● No transient control phase ● No canister purge phase ● Air mass1 40-80 kg/h ● Air mass2 > 100 kg/h	
Diagnostic Time	● 25 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "FR HO2S signal" parameter on the scantool.



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1.1 DIAGNOSTIC TROUBLE CODES

P2191 FUEL SYSTEM TOO LEAN AT P/LOAD

NUMBER OF DTC  :  1  ITEMS
```
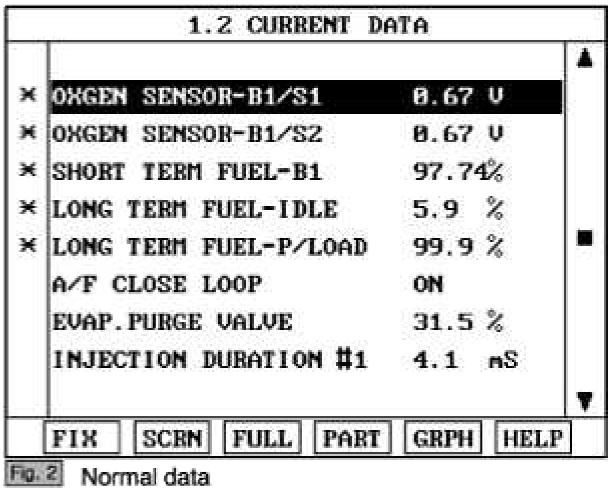

Fig. 1



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1.2 CURRENT DATA

* OXGEN SENSOR-B1/S1       0.67 V
* OXGEN SENSOR-B1/S2       0.67 V
* SHORT TERM FUEL-B1       97.74%
* LONG TERM FUEL-IDLE      5.9  %
* LONG TERM FUEL-P/LOAD    99.9 %
  A/F CLOSE LOOP           ON
  EVAP.PURGE VALVE         31.5 %
  INJECTION DURATION #1    4.1  mS
```

Fig. 2 Normal data

Service standard

For front HO2S

-When decelerating suddeniy from 4000rpm : 200mV or less

-When engine is suddenly raced : 600~1000mV

-1500rpm : The fluctuation between 400mV or less and 600~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

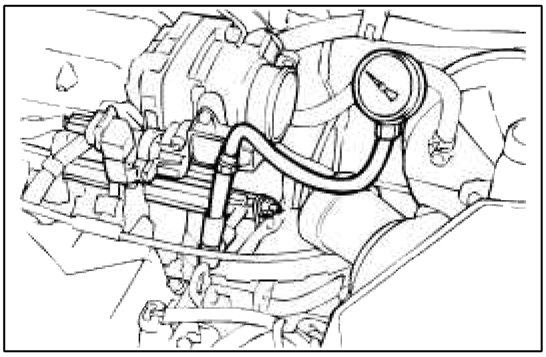
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Check for fuel pressure
   (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.
   (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.
   (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.
   (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.
   (5) Start an engine and warm up to operating temperature.
   (6) Check for fuel pressure at idle.



   (7) Is fuel pressure within specification?

YES

Go to "Check for Exhaust system " as below.

NO

Check fuel delivery system.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for Exhaust system
   (1) Check exhaust system for leaks, cracks, loose connection.(especially exhaust manifold, catalyst around rear HO2S, etc)
   (2) Is exhaust system okay?

YES

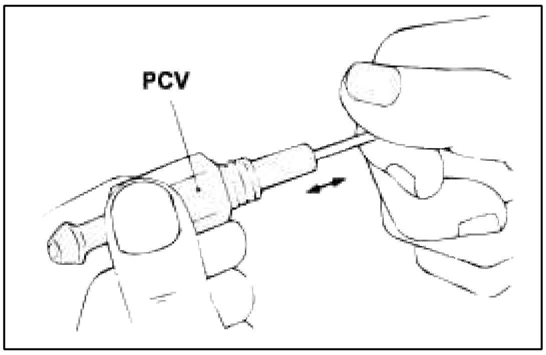
Go to "Check for Intake system"as below.

NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for vacuum and PCV
   Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation.
   (1) Remove the positive crankcase ventilation valve.
   (2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.
   (3) If the plunger does not move,the positive crankcase ventilation valve is clogged.Clean or replace it.



   (4) Are vacuum hoses and PCV OK?

YES

Go to "Check for spark plug" as below.

NO

Replace faulty vacuum hoses or PCV.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for spark plug
   Check the following items below for spark plug.
   (1) Remove spark plugs and check gap and plug condition.
   (2) Check the electrode condition(wear or carbon deposit)
   (3) Check the insulators condition(crack,etc)
   (4) Check the carbon deposit
   (5) Are spark plugs gapped properly and in good condition?

YES

Go to "Check for Fuel injector " as below.

NO

Fauity spark plugs.
Repair as necessary and go to "Verification Vehicle Repair" procedure.

3. Check for Fuel injector
   (1) Check for fuel injector operation.
   (2) Are fuel injectors working normal and dispensing proper volume?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

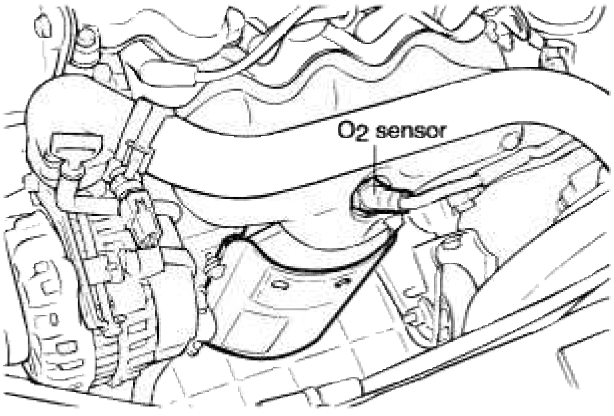
NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

Fuel System > Troubleshooting > P2192

COMPONENT LOCATION



GENERAL DESCTIPTION

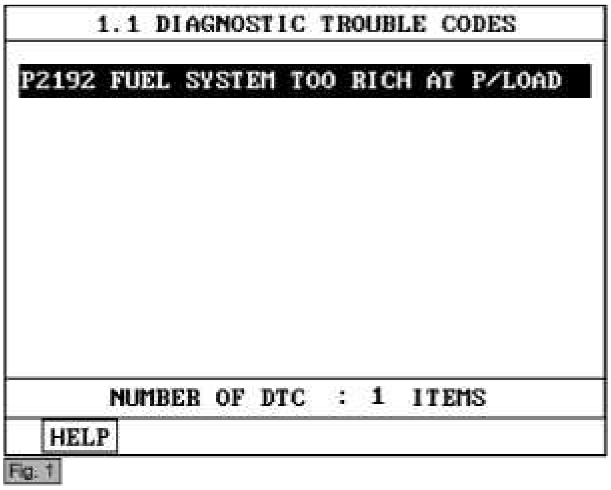
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Fuel trim limit	● Faulty ignition system. ● EVAP PCSV malfunction. ● Faulty fuel injectors. ● Leak in exhaust system. ● Faulty MAP,TPS,ECTS. ● Faulty front HO2S. ● Faulty PCM
Threshold value	● Multiplicative long term value 1,2 : < 0.77	
Enable Conditions	● Coolant temperature > 70 degC(158 °F) ● Intake air temperature < 80 degC(176 °F) ● Throttle angle < 60 % ● Integrated air mass > 10 grams ● Closed loop control enabled ● No transient control phase ● No canister purge phase ● Engine load1 30-55 % ● Engine load2 > 70 %	
Diagnostic Time	● 25 sec	
Fail Safe	● None	

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "FR HO2S signal" parameter on the scantool.



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1.1 DIAGNOSTIC TROUBLE CODES

P2192 FUEL SYSTEM TOO RICH AT P/LOAD

NUMBER OF DTC  :  1  ITEMS
```
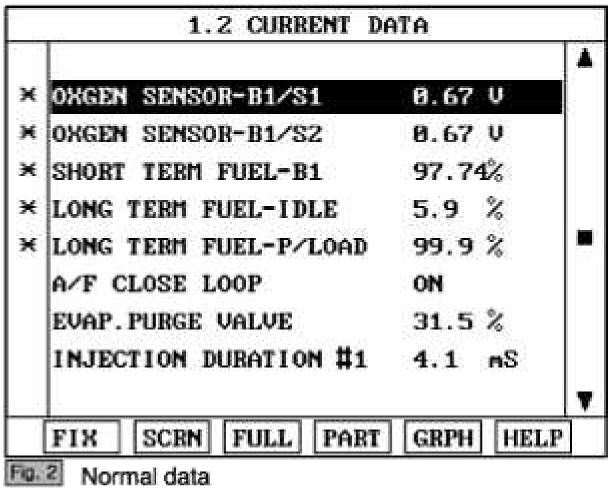

Fig. 1



```
1.2 CURRENT DATA

× OXGEN SENSOR-B1/S1        0.67 V
× OXGEN SENSOR-B1/S2        0.67 V
× SHORT TERM FUEL-B1        97.74%
× LONG TERM FUEL-IDLE       5.9  %
× LONG TERM FUEL-P/LOAD     99.9 %
  A/F CLOSE LOOP            ON
  EVAP.PURGE VALVE          31.5 %
  INJECTION DURATION #1     4.1  mS
```

Fig. 2 Normal data

Service standard

For front HO2S

-When decelerating suddeniy from 4000rpm : 200mV or less

-When engine is suddenly raced : 600~1000mV

-1500rpm : The fluctuation between 400mV or less and 600~1000mV

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" procedure.

NO

Go to "W/Harness Inspection" procedure

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

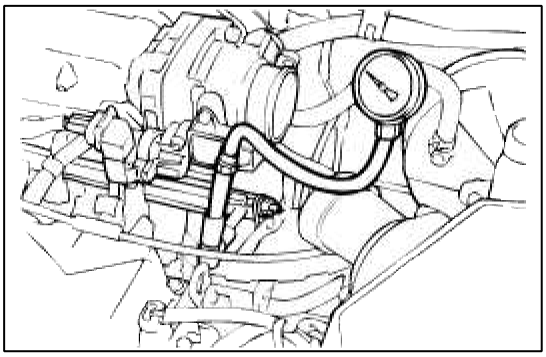
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "System inspection" procedure.

SYSTEM INSPECTION

1. Check for fuel pressure
   (1) Reduce the internal pressure of the fuel pipe and hoses and cover the hose connection with a shop towel to prevent splashing of fuel.
   (2) Remove the bolt connecting the fuel line to the fuel delivery pipe.
   (3) Using the fuel pressure gauge adaptor,install the fuel pressure gauge to the fuel pressure gauge adaptor.
   (4) Apply battery voltage to the terminal for thwe pump drive and activate the fuel pump:then,with fuel pressure applied,check fuel leakage from the pressure gauge or connection part.
   (5) Start an engine and warm up to operating temperature.
   (6) Check for fuel pressure at idle.



   (7) Is fuel pressure within specification?

YES

Go to "Check for Exhaust system " as below.

NO

Check fuel delivery system.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for Exhaust system
   (1) Check exhaust system for leaks, cracks, loose connection.(especially exhaust manifold, catalyst around rear HO2S, etc)
   (2) Is exhaust system okay?

YES

Go to "Check for Intake system"as below.

NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

3. Check for Intake system

   Check intake system for leaks, cracks, loose connection as follwing items :
   (1) Throttle body gasket.
   (2) Gasket between intake manifold and surge tank.
   (3) Seals between intake manifold and fuel injectors.
   (4) Seals between surge tank and PCV valves..
   (5) Is intake system OK?

YES

Go to "Component Inspection" procedure.

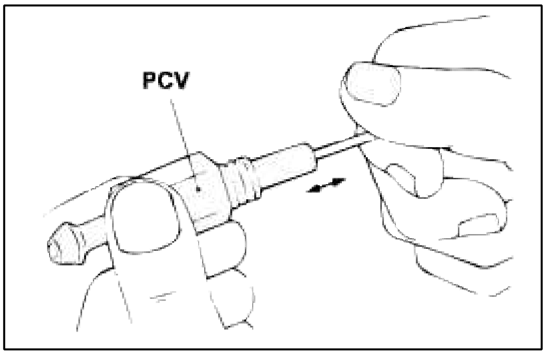
NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

COMPONENT INSPECTION

1. Check for vacuum and PCV

   Check for any split, disconnected or perforated vacuum hoses. Also, check PCV valve for proper operation.
   (1) Remove the positive crankcase ventilation valve.
   (2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.
   (3) If the plunger does not move,the positive crankcase ventilation valve is clogged.Clean or replace it.



   (4) Are vacuum hoses and PCV OK?

YES

Go to "Check for spark plug" as below.

NO

Replace faulty vacuum hoses or PCV.

vRepair as necessary and then go to "Verification of Vehicle Repair" procedure.

2. Check for Fuel injector
    (1) Check for fuel injector operation.
    (2) Are fuel injectors working normal and dispensing proper volume?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"
5. Are any DTCs present ?

YES

Go to the applicable troubleshooting procedure.

NO

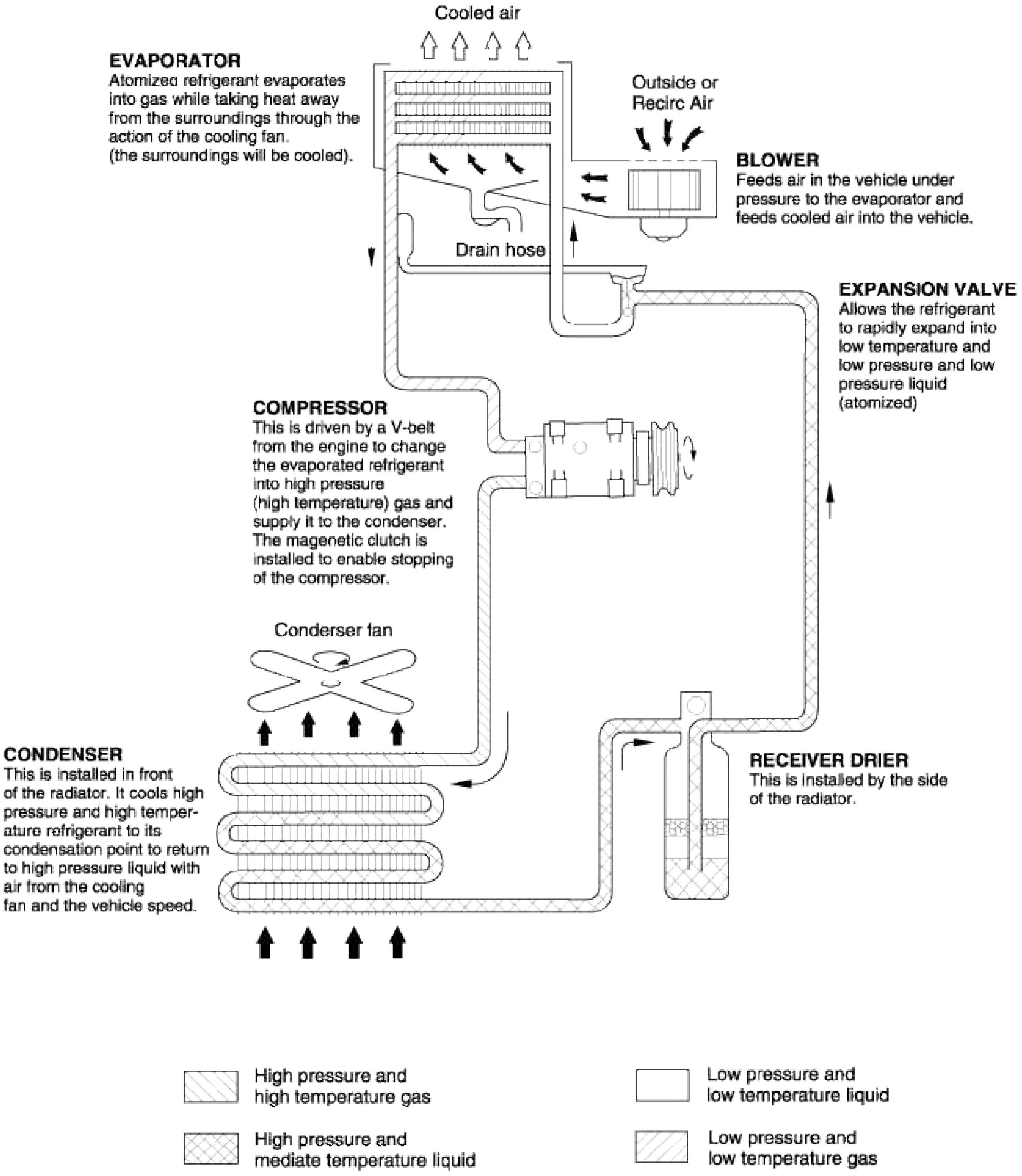
System is performing to specification at this time.

SCHEMATIC DIAGRAM

ACCENT(LC) > 2005 > G 1.5 SOHC > Heating,Ventilation, Air Condioning

Heating,Ventilation, Air Condioning > General Information > Flow Diagram

REFRIGERATION CYCLE


Cooled air
Outside or Recirc Air
Drain hose
Condenser fan
High pressure and high temperature gas
High pressure and mediate temperature liquid
Low pressure and low temperature liquid
Low pressure and low temperature gas

EVAPORATOR
Atomized refrigerant evaporates into gas while taking heat away from the surroundings through the action of the cooling fan.
(the surroundings will be cooled).

BLOWER
Feeds air in the vehicle under pressure to the evaporator and feeds cooled air into the vehicle.

EXPANSION VALVE
Allows the refrigerant to rapidly expand into low temperature and low pressure and low pressure liquid (atomized)

COMPRESSOR
This is driven by a V-belt from the engine to change the evaporated refrigerant into high pressure (high temperature) gas and supply it to the condenser. The magenetic clutch is installed to enable stopping of the compressor.

CONDENSER
This is installed in front of the radiator. It cools high pressure and high temperature refrigerant to its condensation point to return to high pressure liquid with air from the cooling fan and the vehicle speed.

RECEIVER DRIER
This is installed by the side of the radiator.

Heating,Ventilation, Air Condioning > General Information > General Safety Information and Caution

PRECAUTIONS

The air conditioning system uses R-134a refrigerant and FD46XG (PAG) refrigerant oil, which are not compatible with R-12 refrigerant and mineral oil. Do not use R-12 refrigerant or mineral oil in this system, and do not attempt to use R-12 servicing equipment; damage to the air conditioning system or your servicing equipment will result.

CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

If accidental system discharge occurs, ventilate work area before resuming service.
R-134a service equipment or vehicle air conditioning systems should not be pressure tested or leak tested with compressed air.

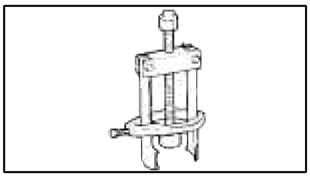
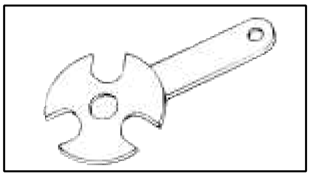
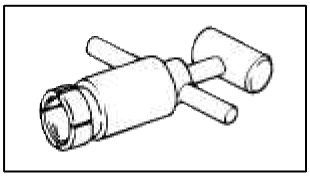
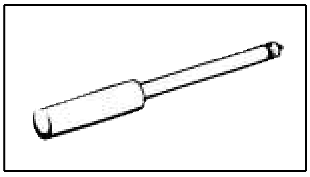
WARNING

- Compressed air mixed with R-134a forms a combustible vapor.
- The vapor can burn or explode causing serious injury.
- Never use compressed air to pressure test R-134a service equipment or vehicle air conditioning systems.

- Always disconnect the negative cable from the battery whenever replacing air conditioning parts.
- Keep moisture and dirt out of the system, When disconnecting any lines, plug or cap the fittings immediately; don t remove the caps or plugs until just before you reconnect each line.
- Before connecting any hose or line, apply a few drops of refrigerant oil to the O-ring.
- When tightening or loosening a fitting, use a second wrench to support the matching fitting.
- When discharging the system, use a R-134a refrigerant recovery/recycling/charging station; don t release refrigerant into the atmosphere.

Heating,Ventilation, Air Condioning > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09455-34000 Bearing and gear puller		Removal of field coil
09977-34000 Pressure plate bolt remover		Removal of pressure plate
09977-33700 Shaft seal remover and installer		Removal and installation of shaft seal
09977-33800 Snap ring remover		Removal of snap ring

Heating,Ventilation, Air Condioning > General Information > Troubleshooting

TROUBLESHOOTING

PROBLEM SYMPTOMS TABLE

Use the table below to help you find the cause of the problem. The numbers indicate the priority of the likely cause of the problem. Check each part in order. If necessary, replace these parts.

STANDARD

Symptom	Suspect Area	Remedy
No blower operation	1. HTR Fuse 2. Blower relay 3. Blower motor 4. Blower resistor 5. Blower speed control switch 6. Wire harness	Replace Replace Replace Replace Replace Replace
No air temperature control	1. Engine coolant capacity 2. Heater control assembly	Add coolant Replace
No compressor operation	1. Refrigerant capacity 2. A/C Fuse 3. Magnetic clutch 4. Compressor 5. Triple pressure switch 6. A/C switch 7. Thermistor 8. Wire harness	Add refrigerant Replace Replace Replace Replace Replace Replace Replace
No cool comes out	1. Refrigerant capacity 2. Refrigerant pressure 3. Drive belt 4. Magnetic clutch 5. Compressor 6. Triple pressure switch 7. Thermistor 8. A/C switch 9. Heater control assembly 10. Wire harness	Add refrigerant Apply a vacuum and add refrigerant Adjust Replace Replace Replace Replace Replace Replace Replace
Insufficient cooling	1. Refrigerant capacity 2. Drive belt 3. Magnetic clutch 4. Compressor 5. Condenser 6. Expansion valve 7. Evaporator 8. Refrigerant lines 9. Triple pressure switch	Add refrigerant Adjust Replace Replace Replace Replace Replace Replace Replace

	9. Triple pressure switch 10. Heater control assembly	Replace
No engine idle-up when A/C switch ON	1. Engine (and ECT) ECU 2. Wire harness	- Replace
No air inlet control	Heater control assembly, cable, door	Replace
No mode control	Heater control assembly, cable, door	Replace
No condenser fan operation	1. ECU-IG Fuse 2. Fan motor 3. Engine (and ECT) ECU 4. Wire harness	Replace Replace - Replace

Heating,Ventilation, Air Condioning > General Information > Repair procedures

ON-VEHICLE INSPECTION

This is a method in which the trouble is located by using a manifold gauge set. Read the manifold gauge pressure when the these conditions are established.

TEST CONDITIONS

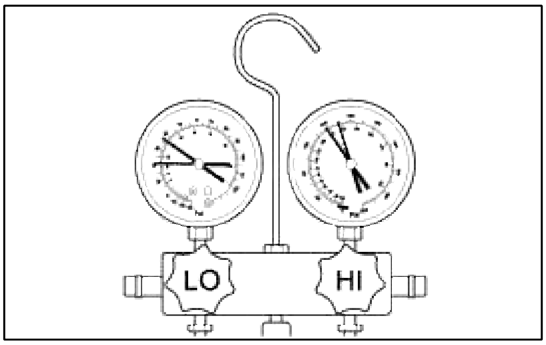
- Temperature at the air inlet with the switch set at RECIRC is 30~35°C (86~95°F)
- Engine running at 1,500rpm
- Blower speed control knob on "4" position
- Temperature control knob on "COOL" position

NOTE

It should be noted that the gauge indications may vary slightly due to ambient temperature conditions.

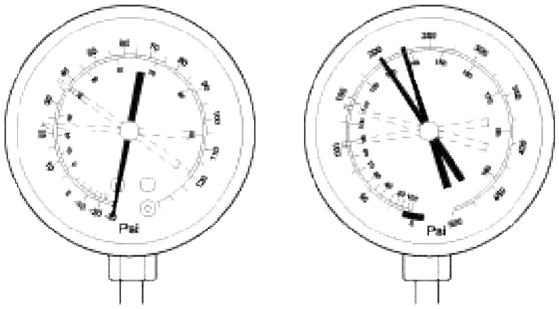
1. Normally functioning refrigeration system.

Gauge reading :
Low pressure side :
0.15~0.25 MPa (21.8~36.3 psi, 1.5~2.5 kgf/cm²)
High pressure side :
1.37~1.57 MPa (199~228 psi, 14~16 kgf/cm²)



2. Moisture present in refrigeration system.

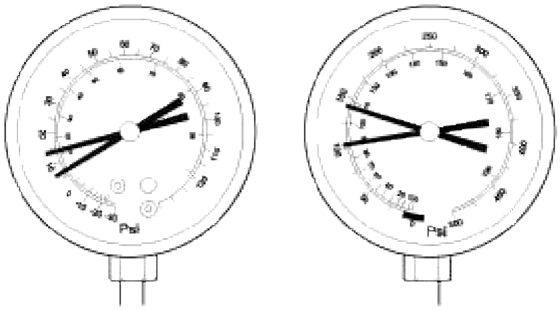
Condition : Periodically cools and then fails to cool



Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
During operation, pressure on low pressure side sometimes become a vacuum and sometime normal	Moisture entered in refrigeration system freezes at expansion valve orifice and temporarily stops cycle, but normal state is restored after a time when the ice melts	• Drier in oversaturected state • Moisture in refrigeration system freezes at expansion valve orifice and block circulation of refrigerant	- Raplace drier - Remove moisture in cycle through repeatec evacuating air - Charge proper amoun of new refrigerant

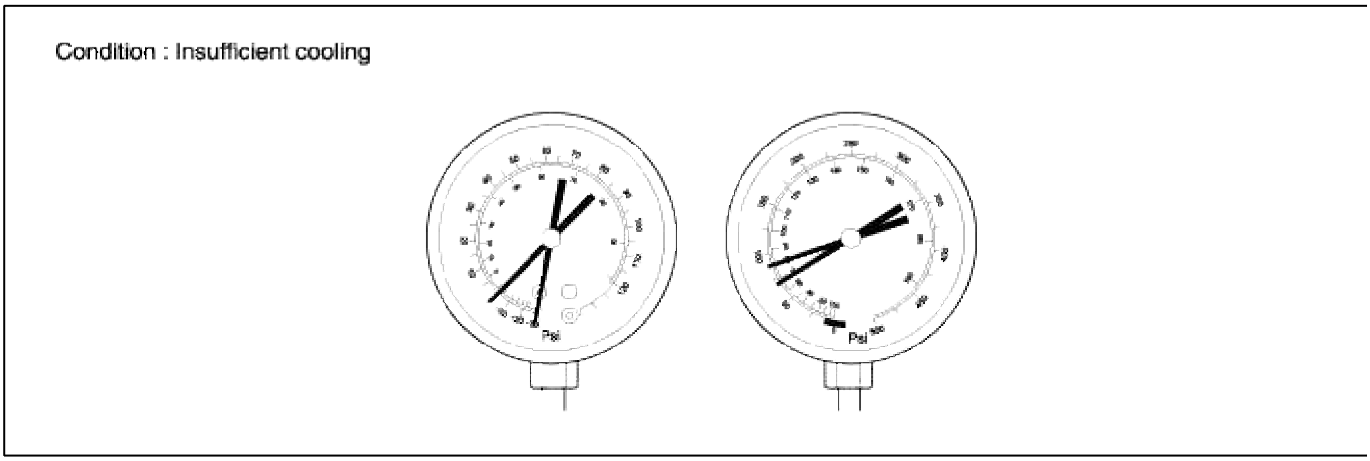
3. Insufficient cooling

Condition : Insufficient cooling



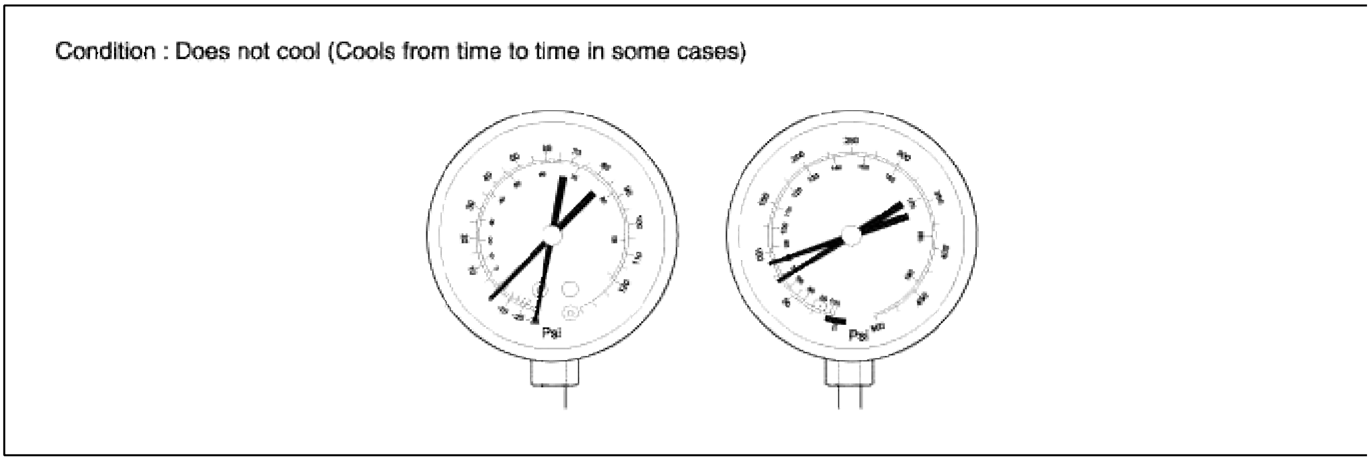
Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure low on both low and high pressure sides • Insufficient cooling performance	Gas leakage at some place in refrigeration system	• Insufficient refrigerant in system • Refrigerant leaking	- Check for gas leakage with gas leak detector and repair if necessary - Charge proper amoun of refrigerant - If indicated pressure value is near 0 when connected to gauge, create the vacuum afte inspecting and repairin the location of the leak

4. Poor circulation of refrigerant


Condition : Insufficient cooling

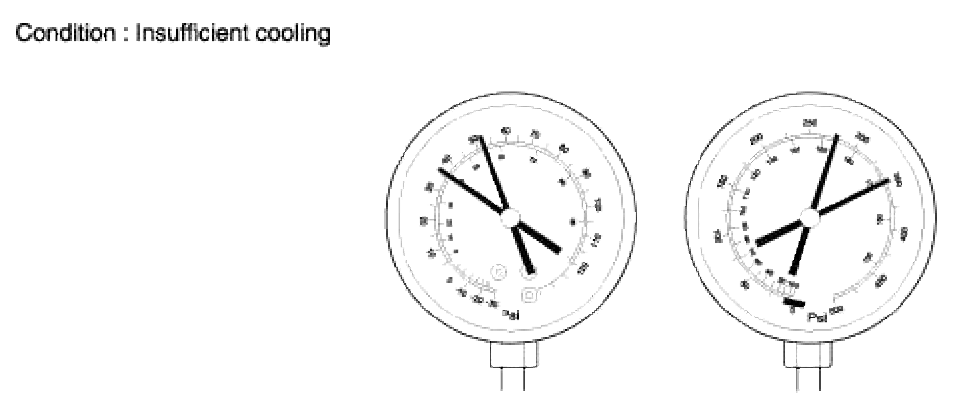
Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure low in both low and high pressure sides • Frost on tube from receiver to unit	Refrigerant flow obstructed by dirt in drier	Condenser clogged	Replace drier

5. Refrigerant does not circulate


Condition : Does not cool (Cools from time to time in some cases)

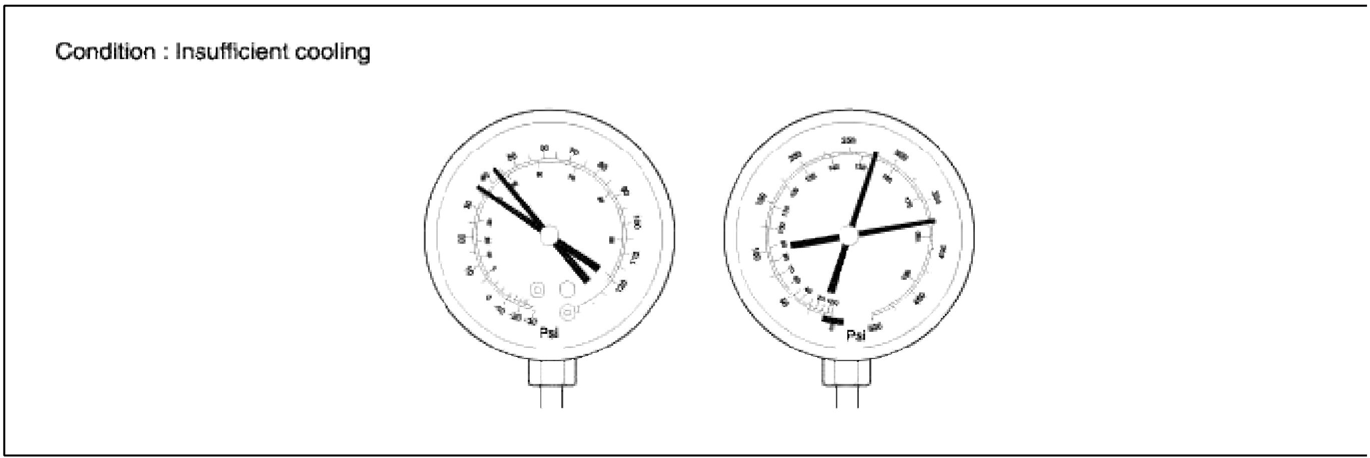
Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Vacuum indicated on low pressure side, very low pressure indicated on high pressure side • Frost or dew seen on piping before and after receiver/drier or expansion valve	• Refrigerant flow obstructed by moisture or dirt in refrigeration system • Refrigerant flow obstructed by gas leakage from expansion valve	Refrigerant does not circulate	- Check expansion valv - Clean out dirt in expansion valve by blowing with air - Replace drier - Evacuate air and charg new refrigerant to proper amount - For gas leakage from expansion valve, repla expansion valve

6. Refrigerant overcharged or insufficient cooling of condenser



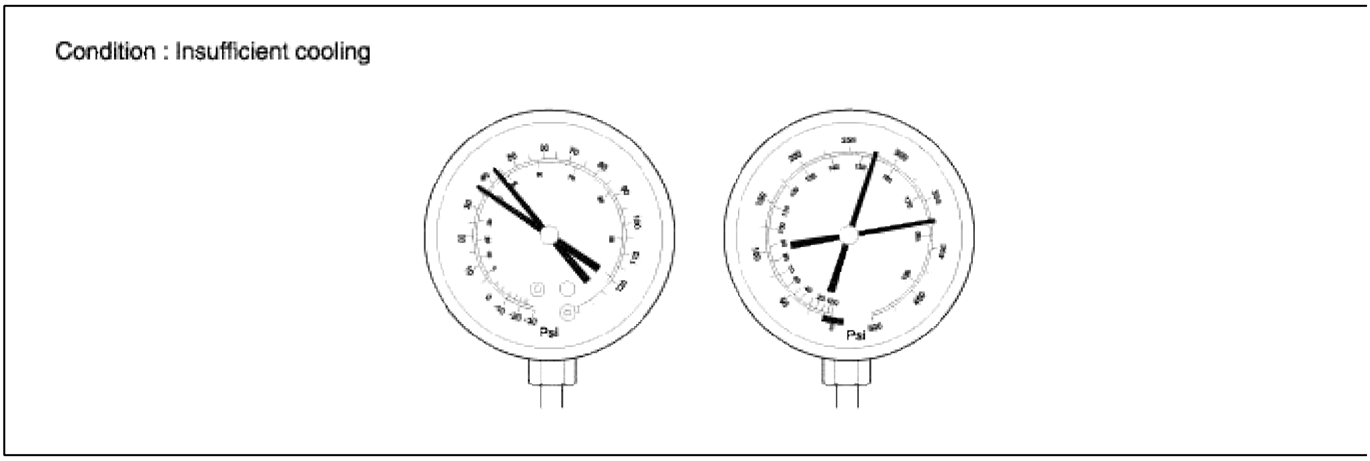
Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
Press too high on both low and high pressure sides	• Unable to develop sufficient performance due to excessive • Insufficient cooling of condenser	• Excessive refrigerant in cycle → refrigerant overcharged • Condenser cooling → condenser fins clogged or condenser fan faulty	- (1) Clean condenser - (2) Check cooling fan with fluid coupling operation. - (3) If (1) and (2) are i normal state, check amount of refrigerant Charge proper amoun of refrigerant

7. Air present in refrigeration system



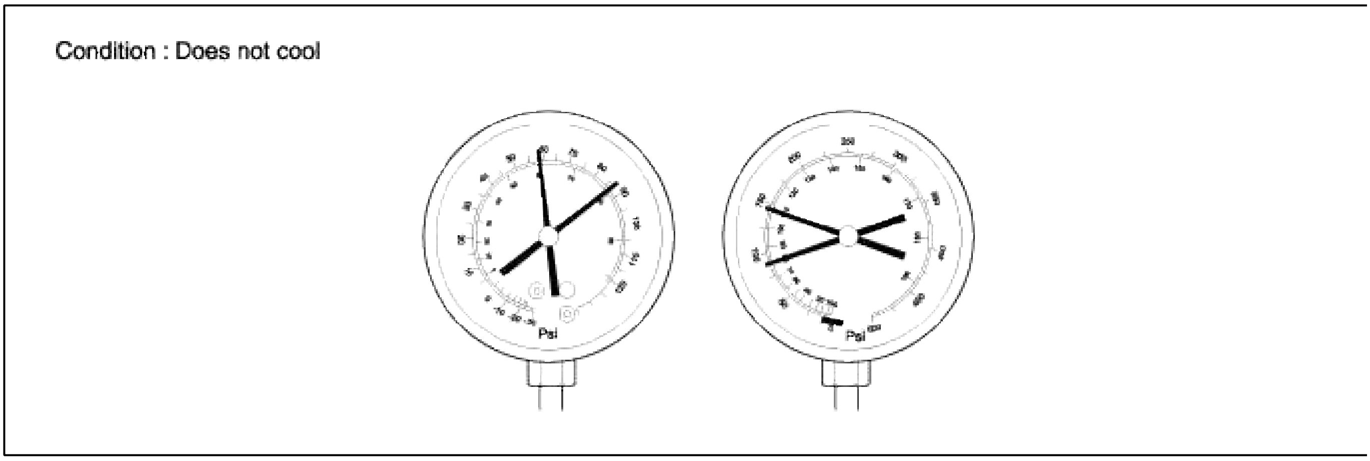
Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Press too high on both low and high pressure sides • The low pressure piping hot to the touch	Air entered in refrigeration system	• Air present in refrigeration system • Insufficient vacuum purging	- Check compressor oil to see if it is see if it is dirty or insufficient - Evacuate air and charg new refrigerant

8. Expansion valve improperly



Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on both low and high pressure sides • Frost or large amount of dew on piping on low pressure side	Trouble in expansion valve	• Excessive refrigerant in low pressure piping • Expansion valve opened too wide	- Check expansion valv - Replace if defective

9. Defective compression compressor



Symptom seen in refrigeration system	Probable cause	Diagnosis	Remedy
• Pressure too high on low high pressure sides • Pressure too low to on high pressure side	Internal leak in compressor	• Compression defective • Valve leaking or broken sliding parts	Repair or replace compressor

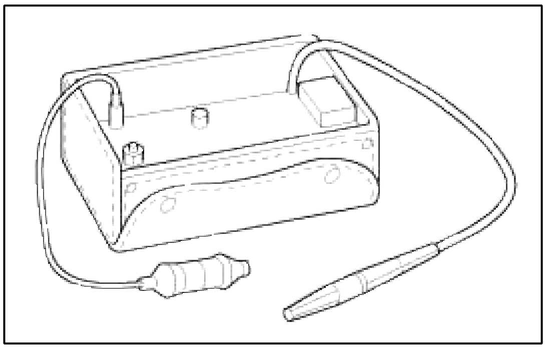
INSPECT FOR LEAKAGE OF REFRIGERANT

Always conduct a leak test with an electronic leak detector whenever leakage or refrigerant is suspected and when conducting service operations which are accompanied by disassembly or loosening or connection fittings.

NOTE

In order to use the leak detector properly, read the manual supplied by the manufacturer.

1. Check the torque on the connection fittings and, if too loose, tighten to the proper torque. Check for gas leakage with a leak detector.
2. If leakage continues even after the fitting has been tightened, discharge the refrigerant from the system, disconnect the fittings, and check their seating faces for damage. Always replace, even if the damage is slight.
3. Check the compressor oil and add oil if required.
4. Charge the system and recheck for gas leaks. If no leaks are found, evacuate and charge the system again.



A/C SYSTEM TESTS

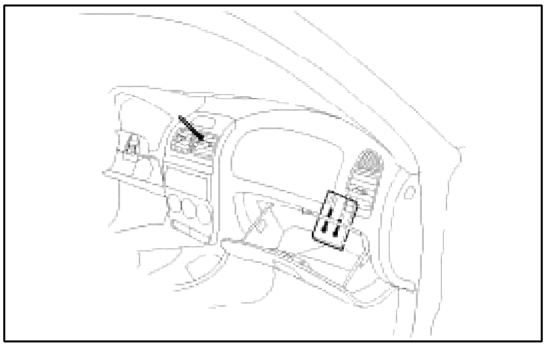
CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

WARNING

- Compressed air mixed with R-134a forms a combustible vapor.
- The vapor can burn or explode causing serious injury.
- Never use compressed air to pressure test R-134a service equipment or vehicle air conditioning systems.

1. Connect a R-134a refrigerant recover/recycling/charging station to the high-pressure service port and the low-pressure service port, following the equipment manufacturer s instructions.
2. Insert a thermometer in the center vent.
   Determine the relative humidity and air temperature.



3. Test conditions :
   A. Avoid direct sunlight.
   B. Open the hood.
   C. Open the front doors.
   D. Set the temperature control dial on MAX COOL, the mode control switch on VENT and the recirculation control switch on RECIRCULATE.
   E. Turn the A/C switch on and the fan switch on MAX.
   F. Run the engine at 1,500 rpm.
   G. No driver or passengers in vehicle.

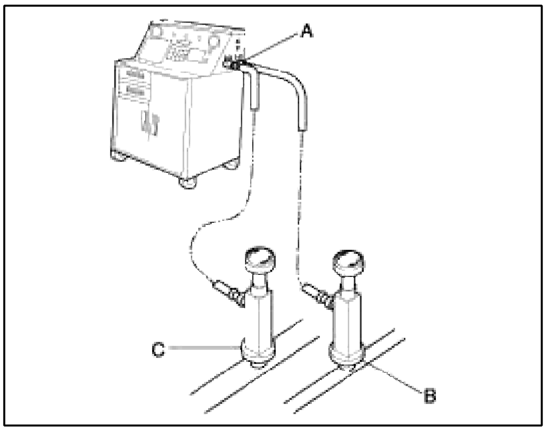
4. After running the air conditioning for 10 minutes under the above test conditions, read the delivery temperature from the thermometer in the dash vent, the intake temperature near the blower unit behind the glove box and the high and low system pressure from the A/C gauges.

REFRIGERANT RECOVERY

CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

1. Connect a R-134a refrigerant recovery/recycling/charging station (A) to the high-pressure service port (B) and the low-pressure service port (C), as shown, following the equipment manufacturer s instruction.



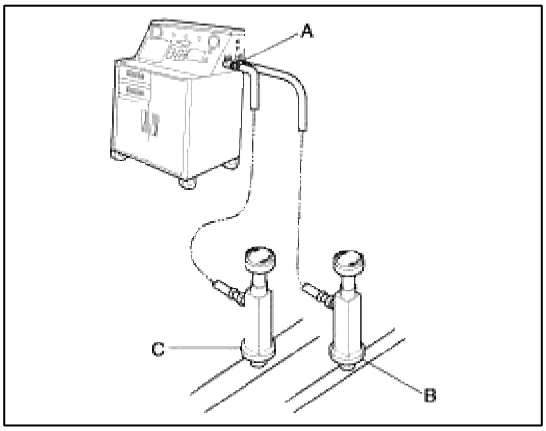
2. Measure the amount of refrigerant oil removed from the A/C system after the recovery process is completed. Be sure to put the same amount of new refrigerant oil back into the A/C system before charging.

SYSTEM EVACUATION

CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

1. When an A/C System has been opened to the atmosphere, such as during installation or repair, it must be evacuated using a R-134a refrigerant recover/recycling/charging station (If the system has been open for several days, the receiver/dryer should be replaced, and the system should be evacuated for several hours.)
2. Connect a R-134a refrigerant recovery/recycling/charging station(A) to the high-pressure service port(B) and the low-pressure service port(C), as shown, following the equipment manufacturer s instruction. Evacuate the system.



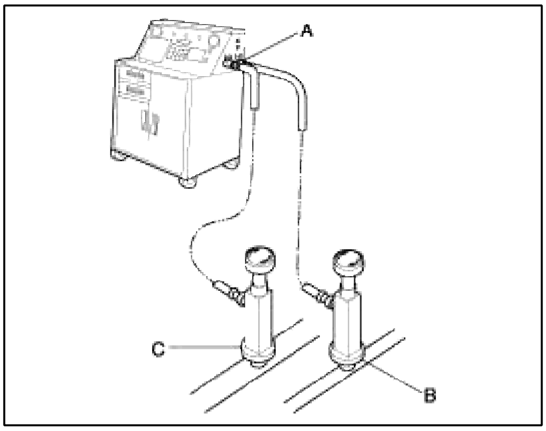
3. If the low-pressure does not reach more than 93.3 kPa (700 mmHg, 27.6 in.Hg) in 15 minutes, there is probably a leak in the system. Partially charge the system, and check for leaks.

SYSTEM CHARGING

CAUTION

- Air conditioning refrigerant or lubricant vapor can irritate your eyes, nose, or throat.
- Be careful when connecting service equipment.
- Do not breathe refrigerant or vapor.

1. Connect a R-134a refrigerant recover/recycling/charging station (A) to the high-pressure service port (B) and the low-pressure service port (C), as shown, following the equipment manufacture s instructions.



2. Add the same amount of new refrigerant oil to the system that was removed during recovery.
3. Carge the system with the specified amount of R-134a refrigerant. Do not overcharge the system; the compressor will be damaged.

Refrigerant capacity :
Select the appropriate units of measure for your charging station : 550 ± 25g

Heating,Ventilation, Air Condioning > General Information > Specifications

SPECIFICATIONS

Item		Specification
Heating	**Heater**	
	- Type	Air mix type
	- Capacity (Kcal/h)	4,500 ± 10%
Air conditioning	**Evaporator**	
	- Cooling capacity (Kcal/h)	4,100 ± 10%
	Compressor	
	- Type	Swash plate (HS-15)
	- Lubricating oil	FD46XG (PAG)
	- Oil capacity (cc)	180 ± 10
	- Piston displacement (cc/rev)	154
	Pressure relief valve (kgf/cm^2)	Working pressure : 35.0 ~ 42.2 Resealed pressure : Min. 28.1
	Magnetic clutch	
	- Pulley pitch dia	ø125
	- Valtage & wattage	D.C 12.8V, Max, 54W
	- Torque	Min. 4.4kg·m

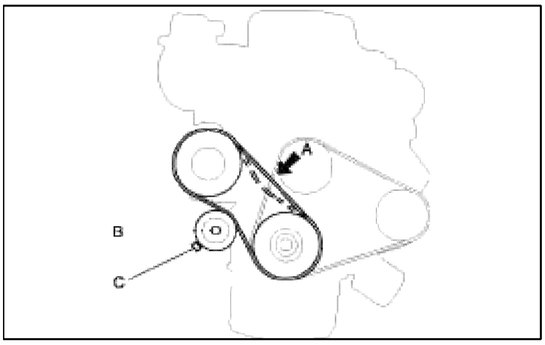
	Condenser - Heat capacity (Kcal/h)	A/T : 11,800 ± 5% M/T 1.6 DOHC : 11,800 ± 5% M/T 1.5 SOHC : 9,400 ± 5%
	Refrigerant&capacity	R-134a (550 ± 25g)
	Triple pressure switch (kgf/cm²)	**High pressure** - ON 32.0 ± 2.0 - OFF 26.0 ± 2.0
		Middle pressure - ON 18.0 ± 0.8 - OFF 14.0 ± 1.2
		Low pressure - ON 23 +0.25/-0.29 - OFF 2.0 ± 0.2
	Expansion valve - Super heat value (kgf/cm²)	1.5 at 0°C 2.2 at 10°C
	Thermostat	OFF 1.5 ± 0.6°C ON 3.0 ± 0.6°C
Heater control assembly		Rotary Cable Type

Heating,Ventilation, Air Condioning > Air conditioning System > Drive belt > Repair procedures

ADJUSTMENT

INSPECTION (GASOLINE)

Deflection :
Used belt : 6.0~7.0mm (0.24~0.28 in.)
New belt : 5.0~5.5mm (0.20~0.22 in.)



NOTE

These items when adjusting belt tension :

- If there are cracks or any damage evident on the belt, replace it with a new one.
- "Used belt" means a belt which has been used for five minutes or more.
- "New belt" means a belt which has been used for less than five minutes.

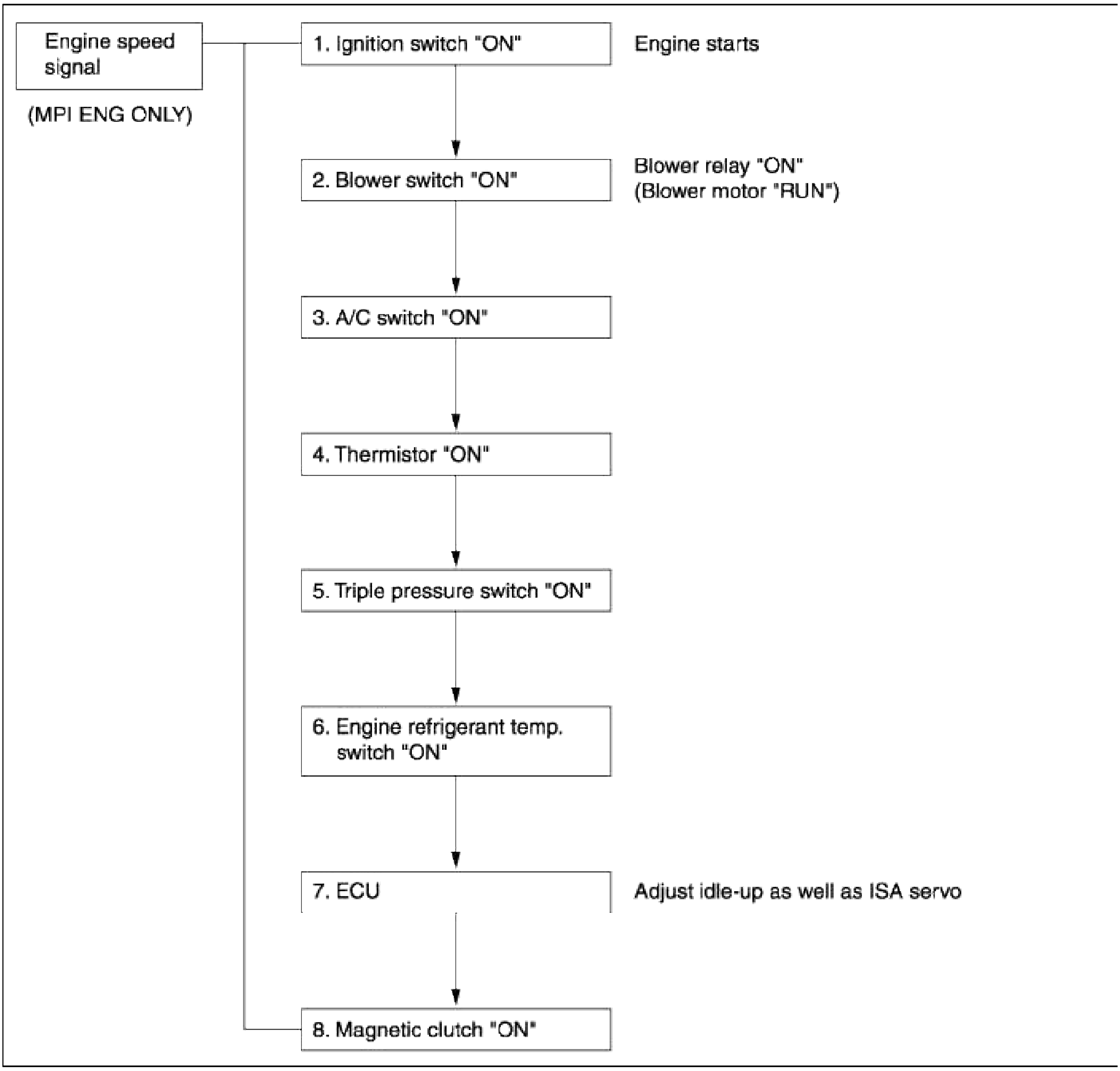
ADJUSTMENT

1. Loosen the tension mounting bolt(B).
2. Turn the adjusting bolt(C) to obtain the proper belt tension, then retighten the mounting bolt.
3. Recheck the deflection of the A/C compressor belt.

Heating,Ventilation, Air Condioning > Air conditioning System > Compressor > Description and Operation

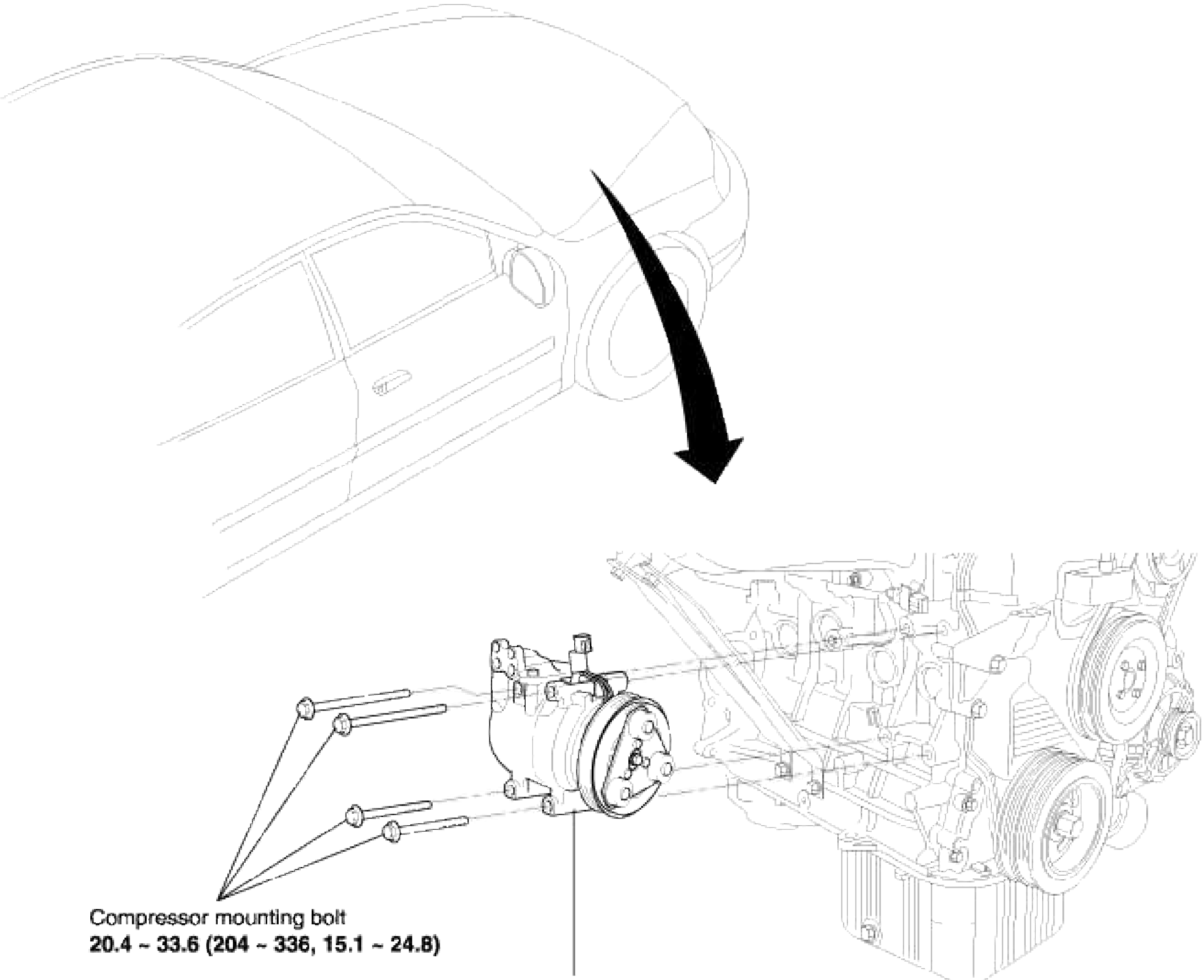
OPERATION

MAGNETIC CLUTCH


Engine speed signal
(MPI ENG ONLY)
1. Ignition switch "ON"
Engine starts
2. Blower switch "ON"
Blower relay "ON"
(Blower motor "RUN")
3. A/C switch "ON"
4. Thermistor "ON"
5. Triple pressure switch "ON"
6. Engine refrigerant temp. switch "ON"
7. ECU
Adjust idle-up as well as ISA servo
8. Magnetic clutch "ON"

Heating,Ventilation, Air Condioning > Air conditioning System > Compressor > Components and Components Location

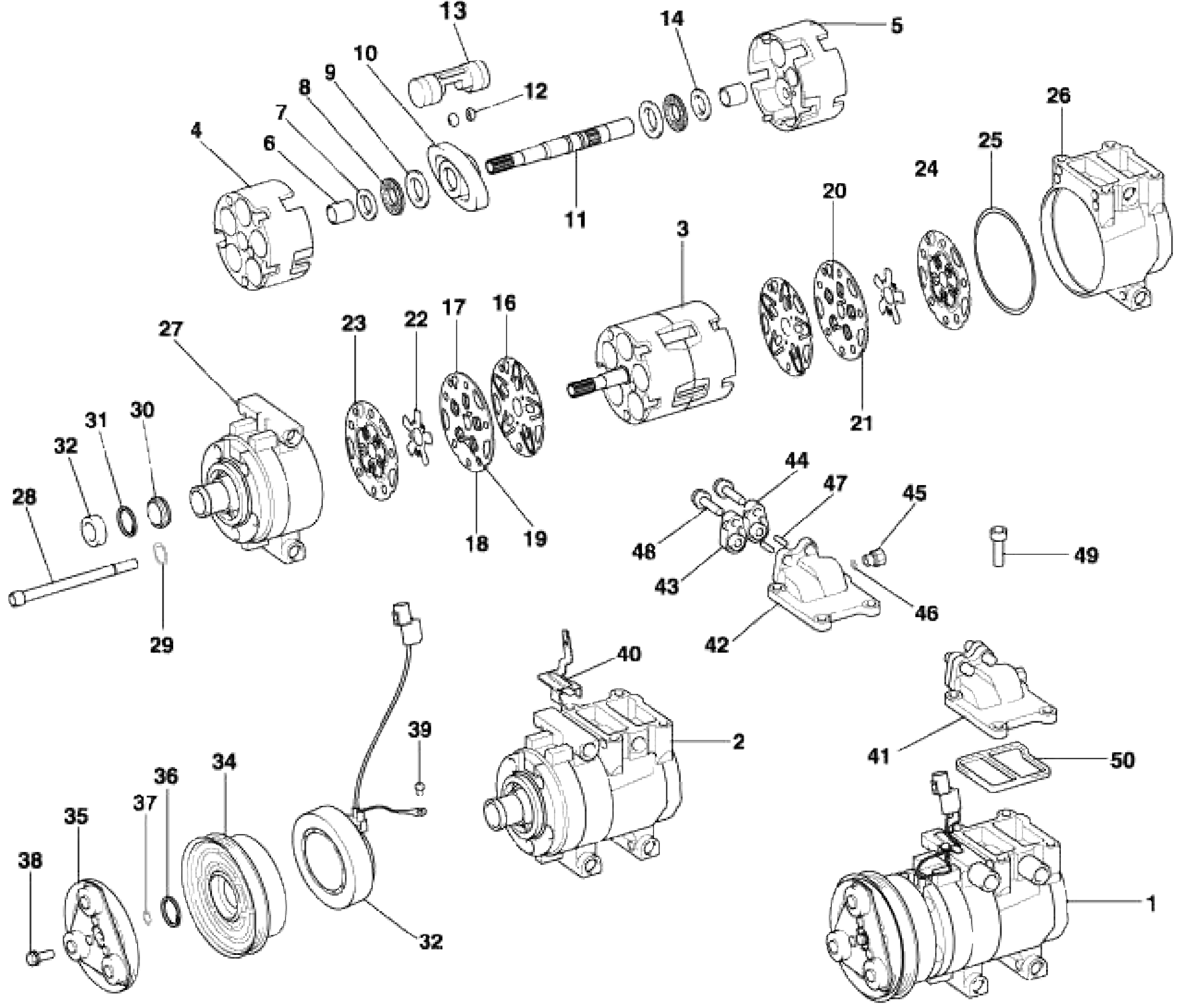
COMPONENT LOCATION


Compressor mounting bolt
20.4 ~ 33.6 (204 ~ 336, 15.1 ~ 24.8)
Compressor

TORQUE : Nm (kgf·cm, lbf·ft)

COMPONENTS

<SOHC>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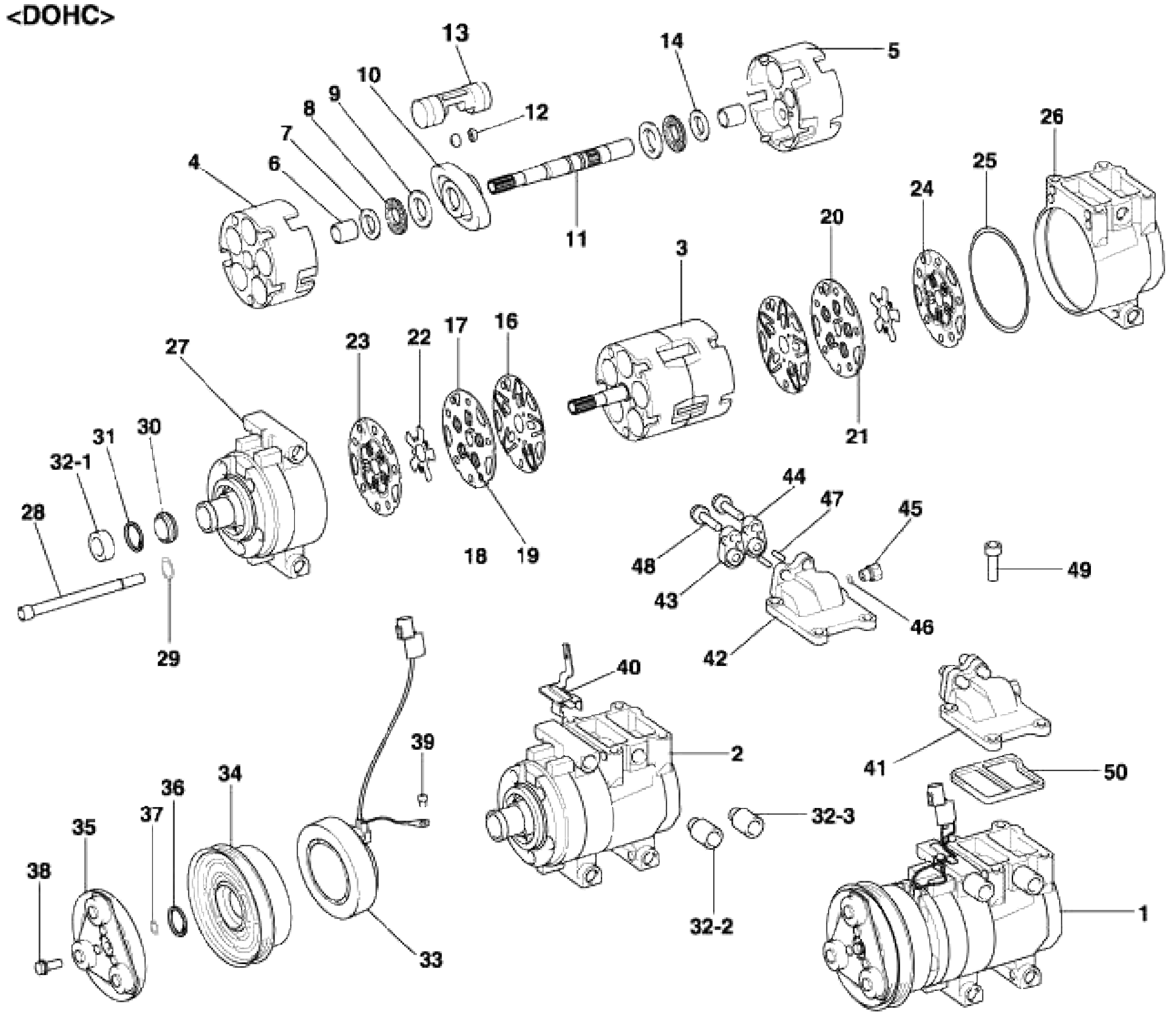
1. Compressor & clutch assembly
2. Compressor assembly
3. Cylinder & shaft assembly
4. Front cylinder
5. Rear cylinder
6. Bushing
7. Thrust bearing race A~K
8. Thrust bearing
9. Thrust bearing race L
10. Swash plate
11. Shaft
12. Shoe
13. Piston
14. Thrust bearing race E
15. Pin spring
16. Inlet reed
17. Front plate assembly
18. Front plate
19. Pin
20. Rear plate assembly
21. Rear plate
22. Discharge reed
23. Front gasket
24. Rear gasket
25. O-ring
26. Rear head
27. Front head
28. Bolt
29. Flat washer
30. Shaft seal
31. Retainer ring
32. Seal felt
33. Field coil
34. Pulley
35. Disc & hub
36. Retainer ring
37. Spacer
38. Bolt
39. Screw
40. Connector bracket
41. Manifold assembly
42. Manifold
43. Suction cap
44. Discharge cap
45. Relief valve
46. O-ring
47. Pin knurling
48. Flange head bolt
49. Bolt wrench
50. Gasket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32-2
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1. Compressor & clutch assembly
2. Compressor assembly
3. Cylinder & shaft assembly
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5. Rear cylinder
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19. Pin
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21. Rear plate
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23. Front gasket
24. Rear gasket
25. O-ring
26. Rear head
27. Front head
28. Bolt
29. Flat washer
30. Shaft seal
31. Retainer ring

32-1 . Seal felt

32-2 . Mounting spacer

32-3 . Mounting spacer

33. Field coil
34. Pulley
35. Disc & hub
36. Retainer ring
37. Spacer
38. Bolt
39. Screw
40. Connector bracket
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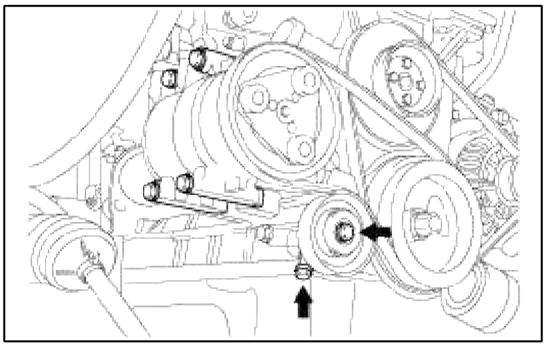
43. Suction cap
44. Discharge cap
45. Relief valve
46. O-ring
47. Pin knurling
48. Flange head bolt
49. Bolt wrench
50. Gasket

Heating,Ventilation, Air Condioning > Air conditioning System > Compressor > Repair procedures

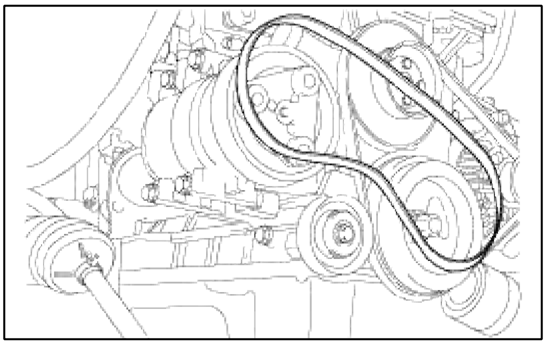
REMOVAL

1. Discharge the refrigerant.

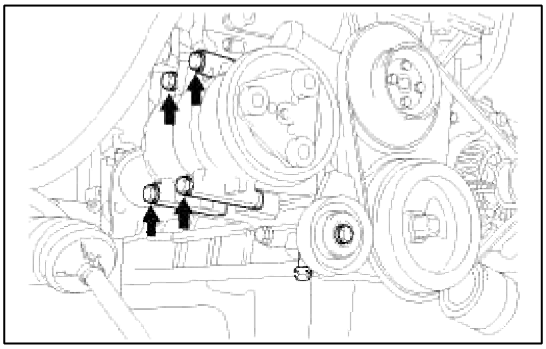
2. Remove the tension bolt.



3. Remove the drive-belt.



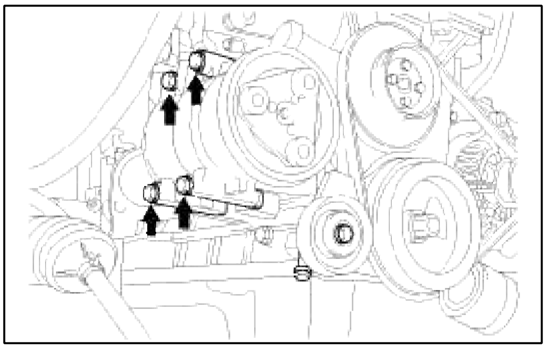
4. Remove the suction hose and discharge hose from the compressor.
5. Remove the 4 mounting bolts on the compressor.



6. Remove the compressor downwards.

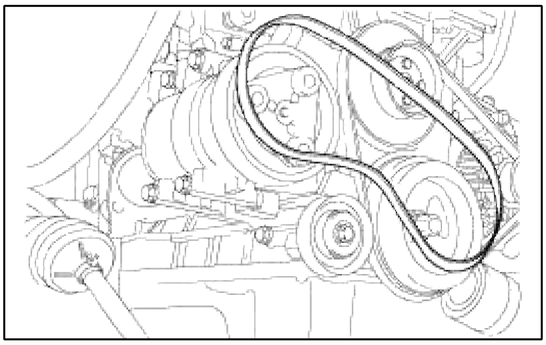
INSTALLATION

1. Tighten the 4 compressor mounting bolts.



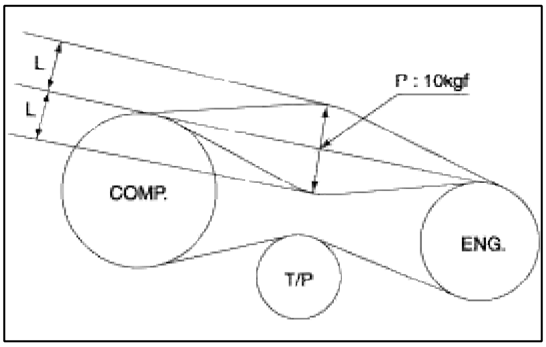
2. Connect the suction hose and discharge hose to the compressor.

3. Connect the drive-belt.



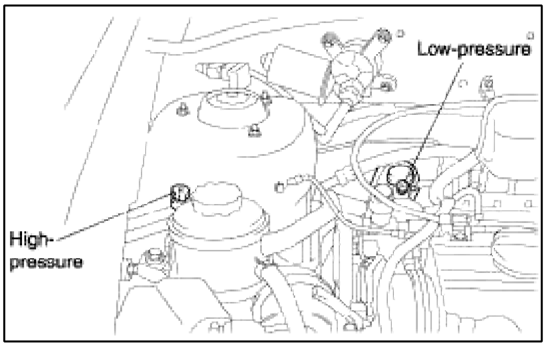
4. Adjust the drive-belt tension.

Item	Deflection L (mm)
New one	5~5.5
Used one	6~7
After driving	8


L
L
P : 10kgf
COMP.
ENG.
T/P

5. Supply the coolant.

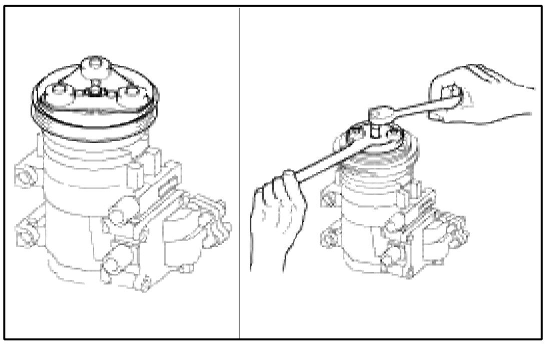
Specified amount : 550 ± 25g


Low-pressure
High-pressure

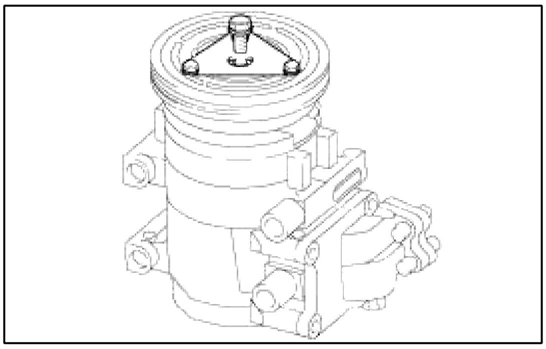
DISASSEMBLY

CLUTCH HUB AND PULLEY

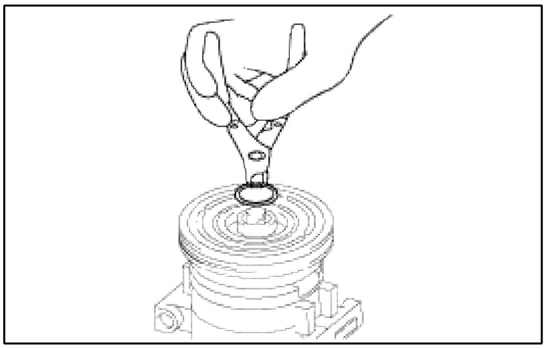
1. Remove the clutch hub supporting bolt using a spanner wrench.



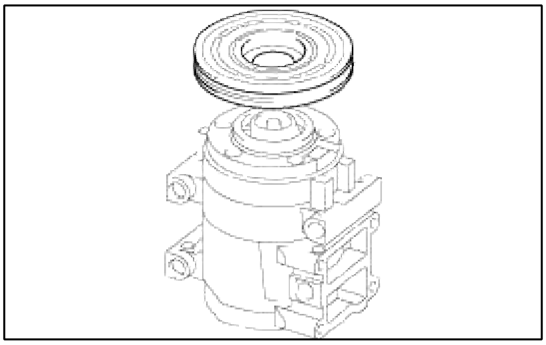
2. Pull out the clutch hub and shim from the compressor shaft. If it is hard to pull out, insert a 8mm bolt into the shaft hole to remove the hub from the shaft.



3. Remove the pulley supporting the snap ring.



4. Remove the pulley and bearing assembly from the compressor.



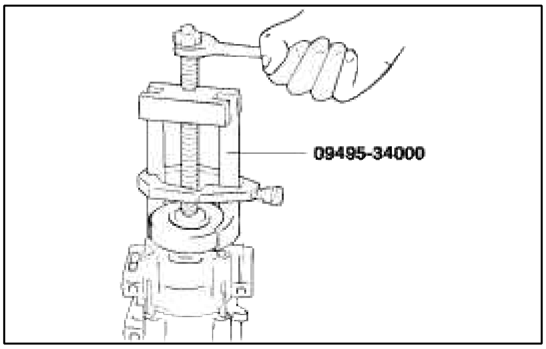
CLUTCH FIELD COIL

1. Remove the clutch hub and pulley.
2. Install a shaft protection tool at the compressor opening.
3. Install the pulley at the compressor.
   Place the puller screw end at the shaft protectors center concave and the puller projection around the rear side field coil.

4. Turn the puller screw using a wrench and remove the coil.

CAUTION

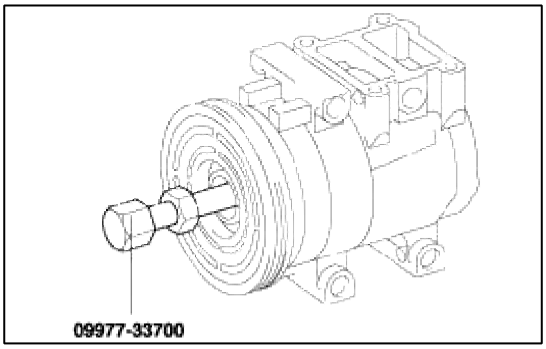
Do not use air tools.

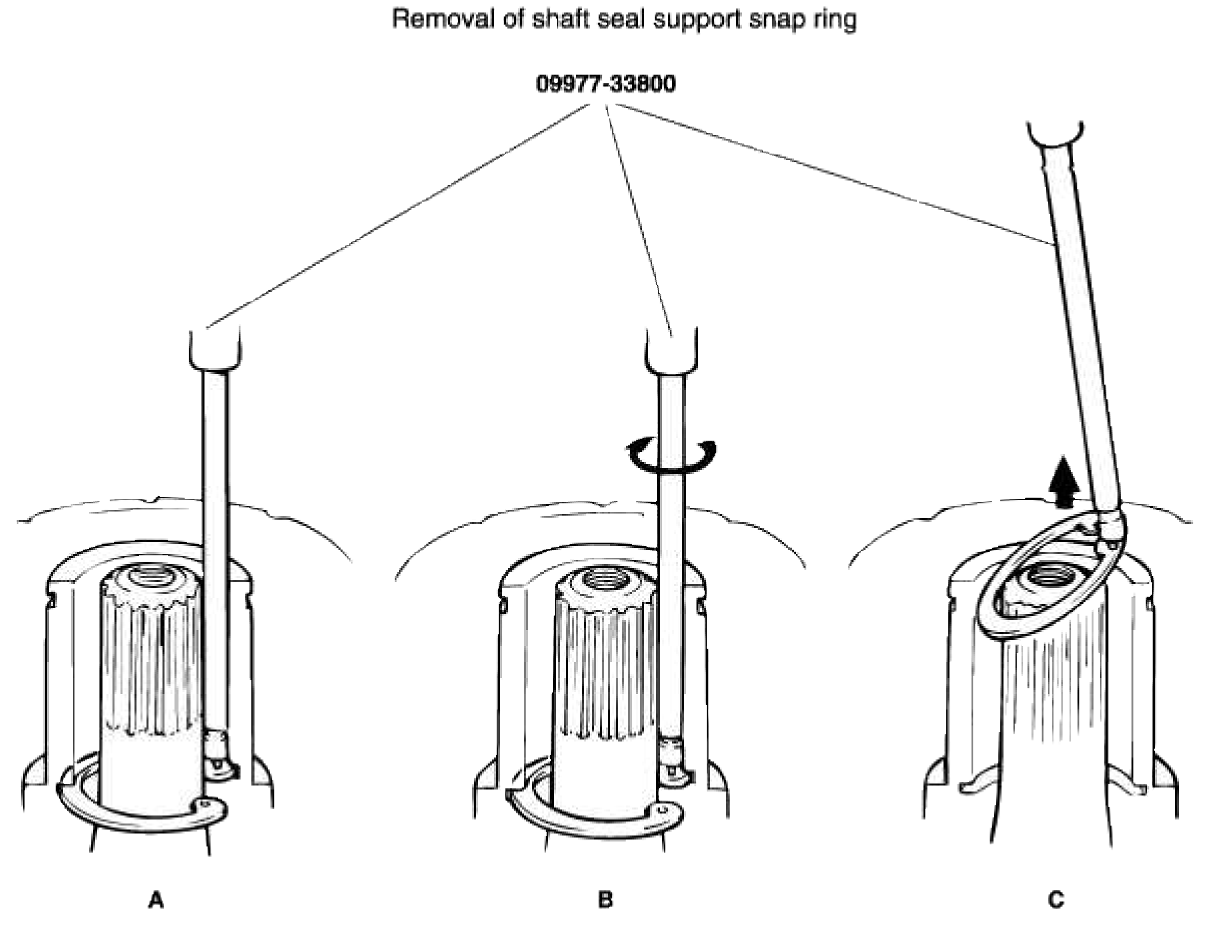


SHAFT SEAL

Prior to replacement of the compressor shaft, remove the compressor from the vehicle and discharge the refrigerant.

1. Remove the clutch hub from the compressor.
2. Remove the shaft seal felt from the nose of the compressor with a pick type tool.
3. Blow any debris from inside the compressor nose with low pressure compressed air. Then, clean the inside and outside nose area of the compressor with a lint-free cloth to remove any oil and dirt.
4. Using a snap ring remover, remove the shaft seal support snap ring out of the compressor nose.
    (1) Insert tip of the snap ring remover into one of the snap ring eyes (View A).
    (2) Rotate the snap ring remover to position the tool tip and snap ring eye closest to the compressor shaft (View B).
    (3) Pull the snap ring remover tool up quickly while keeping the tool shaft against the side of the nose opening to remove the snap ring (View C).
5. Position the shaft seal remover tool (09977-33700) over the compressor shaft and push the tool into the nose of t compressor and down against the shaft seal. Engage the end of the tool with the internal diameter of the shaft seal. While holding the hex part of the tool, turn the tool handle clockwise to expand the tool tip inside the seal inner radius. Then, pull the shaft seal from the compressor with the tool

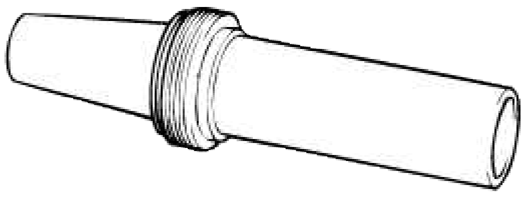




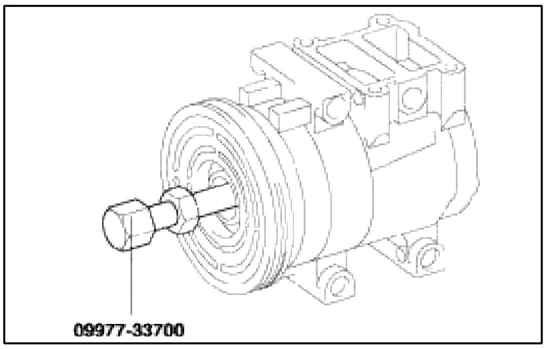
REASSEMBLY

SHAFT SEAL

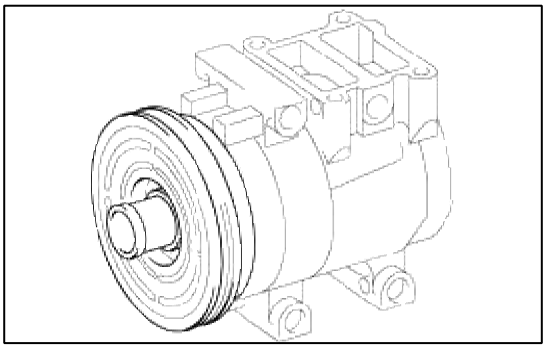
1. Obtain a new shaft seal kit. Carefully remove the contents from the package and locate the plastic shaft seal protector. Inspect the protector for any burrs or other damage. Do not use the protector if it is damaged. Obtain another shaft seal kit and use the protector from it.
2. Using a clean lint-free cloth, clean the shaft and the seal pocket inside the compressor nose.
3. Dip the shaft seal protector and seal in clean refrigerant oil and position the seal on the protector with the lip of the seal pointing toward the large end of the protector.



4. Place the seal protector with shaft seal over the end of the compressor shaft.



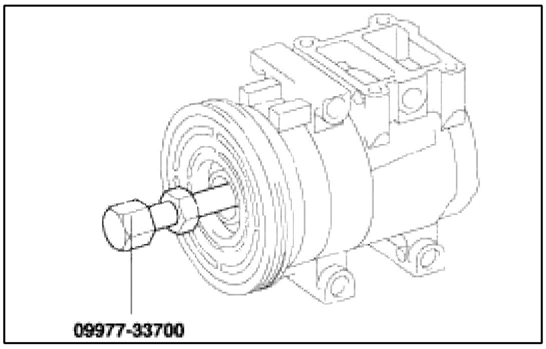
5. Place the shaft seal installer tool over the end of the shaft seal protector. Then, slowly push the shaft seal down the protector until it is seated in the compressor.



6. Remove the seal installer and seat protector from the compressor.
7. Place a new seal retaining snap ring into the compressor nose opening and seat the snap ring into the groove with the remover tool.
8. Leak test the shaft seal installation after rotating the shaft about 10 revolutions with the clutch hub.
9. Install a new felt into the compressor nose.
10. Install the clutch hub on the compressor as outlined in this section.

CLUTCH FIELD COIL

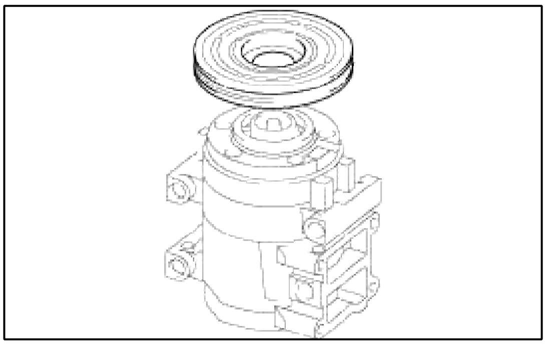
1. Clean the front head coil mounting portion.
2. Place the compressor vertically and put the coil in position of compressor front head.
   Check the electric connector of clutch coil is located in position.
3. Place the coil compression tool in the compressor nose and the center of field coil.
4. Place two 8 inch pullers on the compressor and compression tool. The jaws of puller should deeply hold the front mounting portion of compressor, then the screw should be located in the central position of the compression tool.
5. Using a wrench, tighten the screw so as to securely seat the coil on the compressor front head.
6. Install the clutch pulley and hub on the compressor.



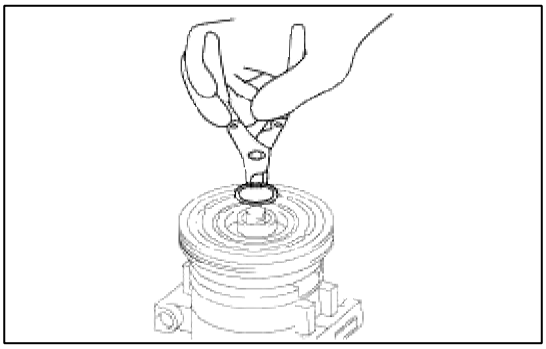
CLUTCH HUB AND PULLEY

1. Clean the pulley bearing surface of the compressor head and remove dirt and rust.

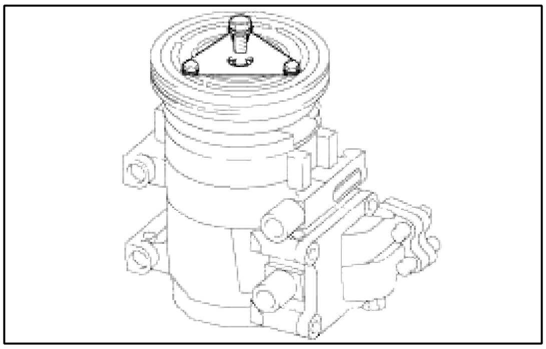
2. Install the pulley and bearing on the compressor.



3. Install the snap ring with the bevelled side facing outward.



4. Place shim of specified side at the hub spline opening inside and slide the hub onto the compressor shaft end.

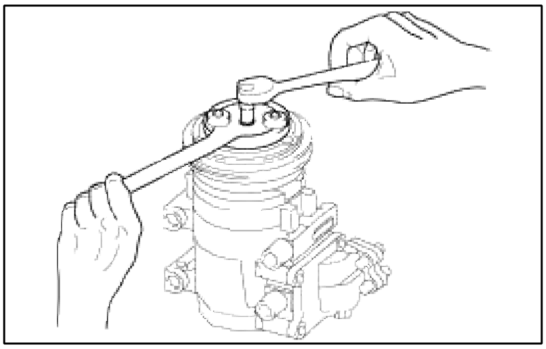


5. Install a new hub supporting bolt on the compressor shaft end. Tighten the bolt to the specified torque.

Tightening torque : 110~140kgf·cm

CAUTION

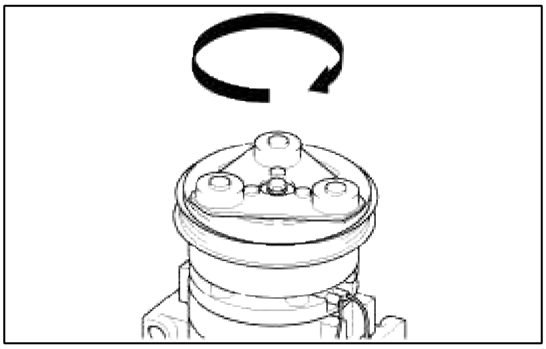
Do not use air tools.



INSPECTION

1. Check the plated parts of the pressure plate for color changes, peeling or other damage. If there is damage, replace the clutch set.

2. Check the pulley bearing play and drag by rotating the pulley by hand. Replace the clutch set with a new one if it is noisy or has excessive play/drag.

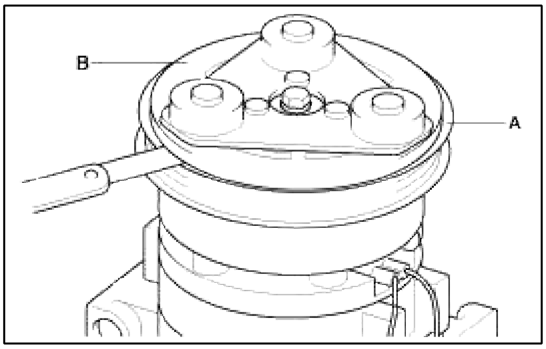


3. Measure the clearance between the pulley (A) and the pressure plate (B) all the way around. If the clearance is not within specified limits, remove the pressure plate and add or remove shims as needed to increase or decrease clearance.

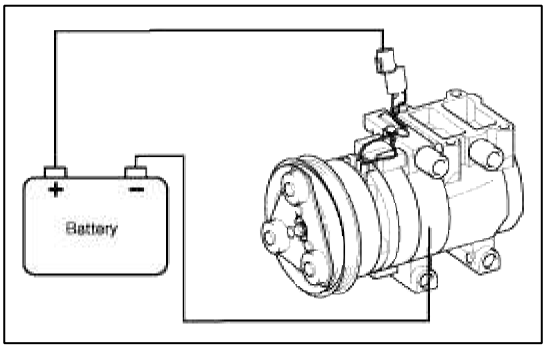
Clearance : 0.35 ~ 0.75mm (0.0138 ~ 0.0295 in.)

NOTE

The shims are available in seven thicknesses : 0.7mm, 0.8mm, 0.9mm, 1.0mm, 1.1mm, 1.2mm and 1.3mm.



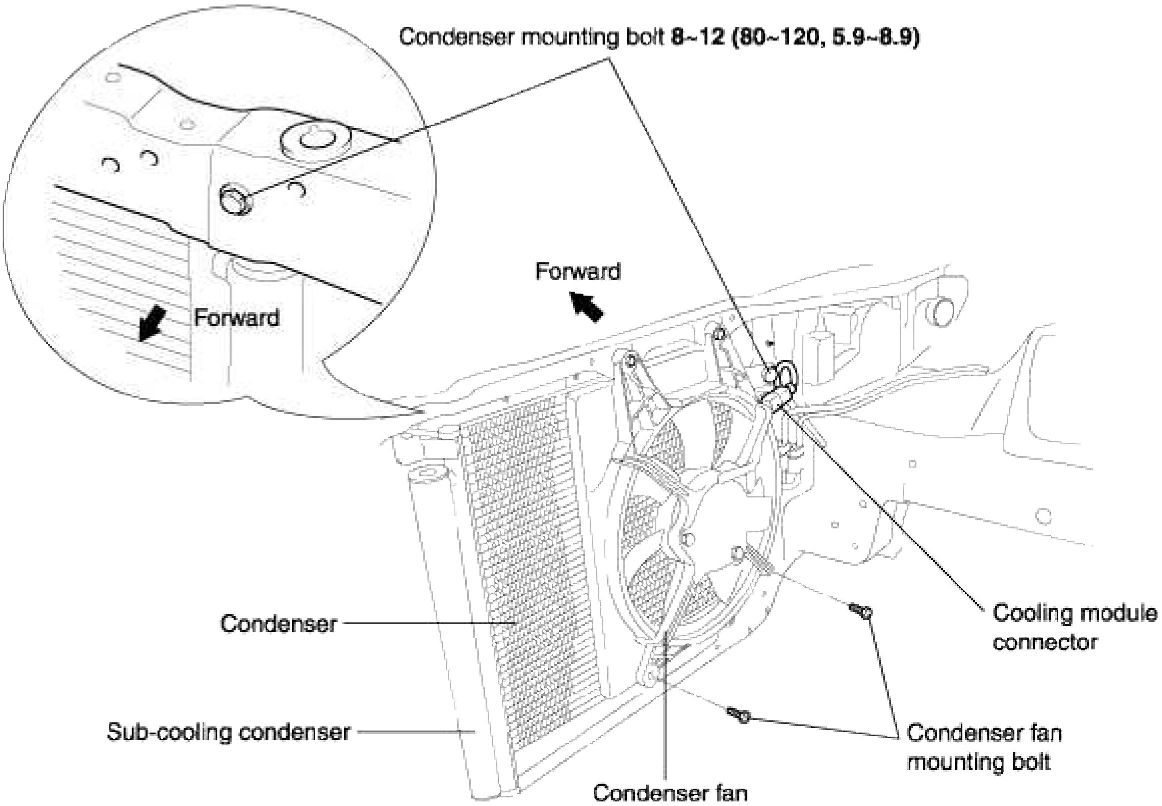
4. Check operating of the magnetic clutch.
   Connect the compressor side terminals to the battery (+) terminal and the ground battery (-) terminal to the compressor body.
   Check the magnetic clutch operating noise to determine the condition.



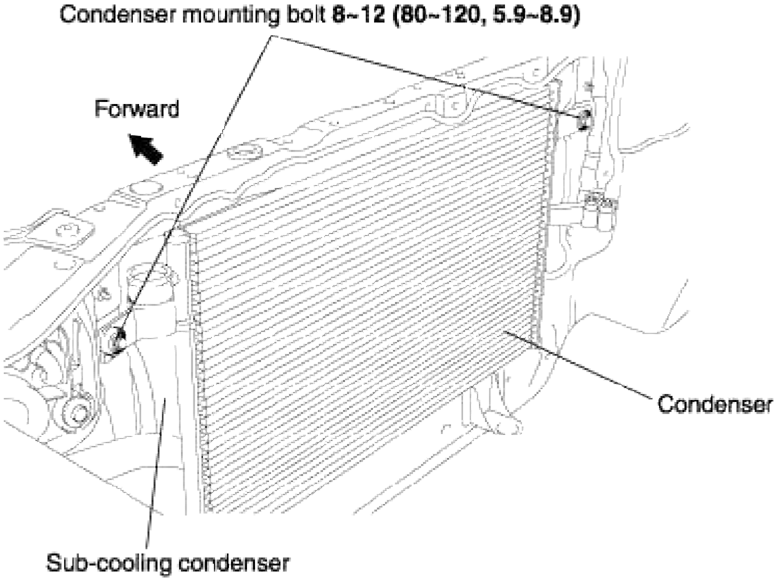
Heating,Ventilation, Air Condioning > Air conditioning System > Condenser > Components and Components Location

COMPONENTS

[M/T]


Condenser mounting bolt 8~12 (80~120, 5.9~8.9)
Forward
Forward
Cooling module connector
Condenser
Sub-cooling condenser
Condenser fan mounting bolt
Condenser fan

[A/T]

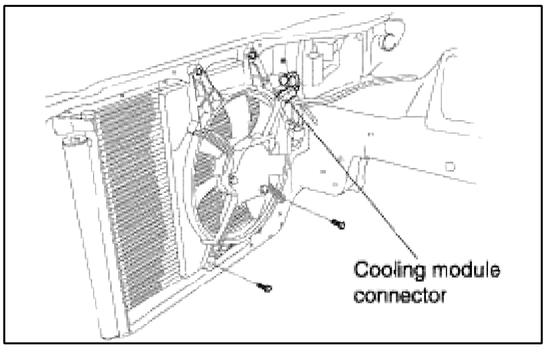

Condenser mounting bolt 8~12 (80~120, 5.9~8.9)
Forward
Condenser
Sub-cooling condenser

TORQUE : Nm (kgf·cm, lbf·ft)

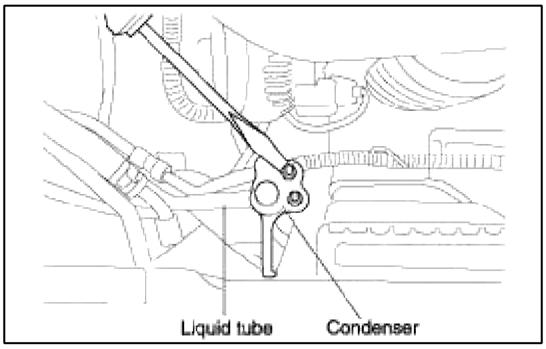
Heating,Ventilation, Air Condioning > Air conditioning System > Condenser > Repair procedures

REMOVAL

1. Remove the cooling module connector.

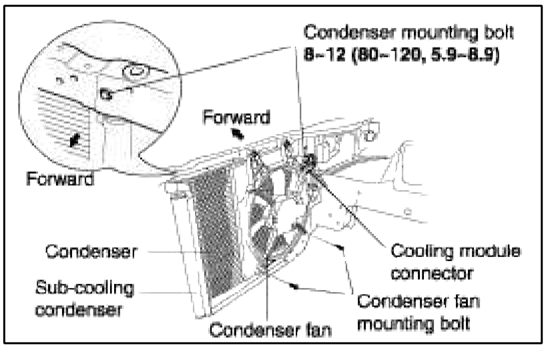

Cooling module
connector

2. Remove the cooling module (condenser fan).
3. Remove the liquid tube nut.


Liquid tube
Condenser

4. Remove the condenser mounting bolts (2).

Tightening torque:
8~12Nm (80~120kfg·cm, 5.9~8.9lbf·ft)


Condenser mounting bolt
8~12 (80~120, 5.9~8.9)
Forward
Forward
Condenser
Sub-cooling
condenser
Condenser fan
Cooling module
connector
Condenser fan
mounting bolt

5. Remove the condenser upward by pressing the radiator backward the vehicle.

INSTALLATION

Installation is the reverse of removal.

INSPECTION

1. Check condenser pin for clogging and damage. If clogged, clean it with water, and blow it with compressed air. If bent, gently stretch it using a screwdriver or pliers.
2. Check the condenser connection area for leakage, and repair or replace if required.

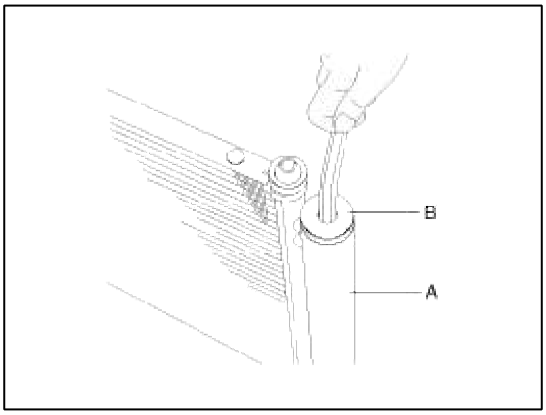
Heating,Ventilation, Air Condioning > Air conditioning System > Receiver/Drier > Repair procedures

REPLACEMENT

1. Remove the condenser, and then remove the bottom cap (B) from the receiver/drier tank (A).

WARNING

Use of impact wrench may cause cracking on the receiver/drier tank connecting pipe to the condenser.



2. Remove the desiccant from the receiver/drier tank using a long nose plier.
3. Check for crumbled desiccant and clogged bottom cap filter.
4. Apply air conditioning compressor oil along the O-rings and threads of the new bottom cap.
5. Insert the new desiccant into the receiver drier tank. The desiccant must be sealed in vacuum before it is exposed to air for use.
6. Install the new bottom cap to the receiver drier tank.

Tightening torque :
20~25Nm (2.0~2.5kgf·m, 14.5~18.2 lbf·ft)

NOTE

Always replace the desiccant and bottom cap at the same time.

Heating,Ventilation, Air Condioning > Air conditioning System > Triple pressure switch > Description and Operation

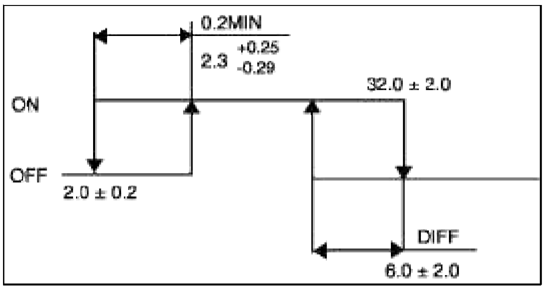
DESCRIPTION

The triple switch is a combination of a middle switch as well as conventional low pressure and high pressure switches. The low pressure switch will turn off to stop compressor operation if refrigerant pressure is low. The high pressure switch will turn off to stop compressor operation if refrigerant pressure is too high. The middle switch will it turn on at a medium level pressure to determine the A/C system is overheating. It will cool the A/C system by operating the radiator fan and the condenser fan at high speed.

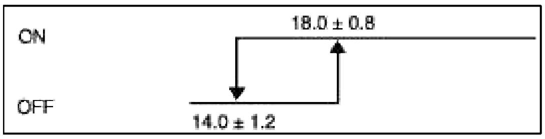
OPERATING CHARACTERISTIC (kgf/cm²)

Pressure	ON	OFF
High	32.0 ± 2.0	26.0 ± 2.0
Low	2.3 + 0.25 / -0.29	2.0 ± 0.2
Middle	18.0 ± 0.8	14.0 ± 1.2

LOW & HIGH

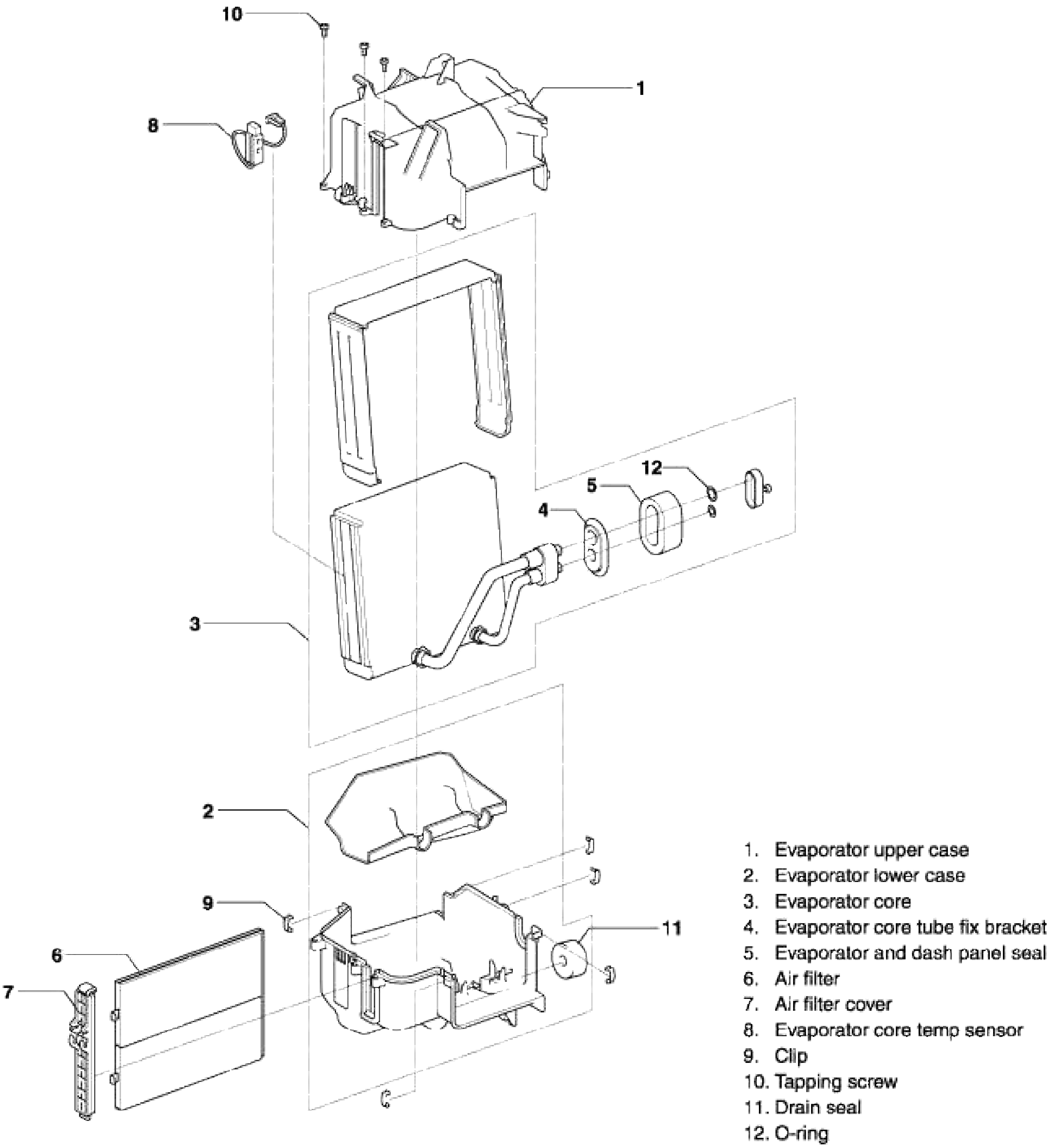

0.2MIN
2.3 +0.25 -0.29
ON
OFF
32.0 ± 2.0
2.0 ± 0.2
DIFF
6.0 ± 2.0

MIDDLE


ON
18.0 ± 0.8
OFF
14.0 ± 1.2

Heating,Ventilation, Air Condioning > Air conditioning System > Evaporator unit > Components and Components Location

COMPONENTS



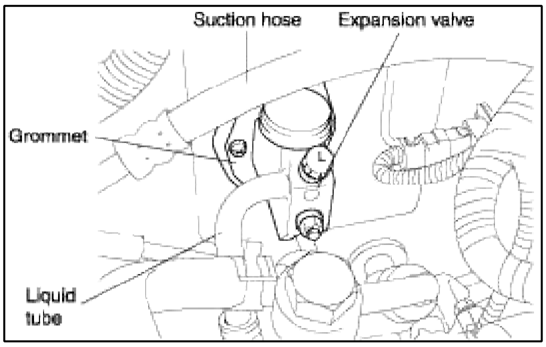
1. Evaporator upper case
2. Evaporator lower case
3. Evaporator core
4. Evaporator core tube fix bracket
5. Evaporator and dash panel seal
6. Air filter
7. Air filter cover
8. Evaporator core temp sensor
9. Clip
10. Tapping screw
11. Drain seal
12. O-ring

Heating,Ventilation, Air Condioning > Air conditioning System > Evaporator unit > Repair procedures

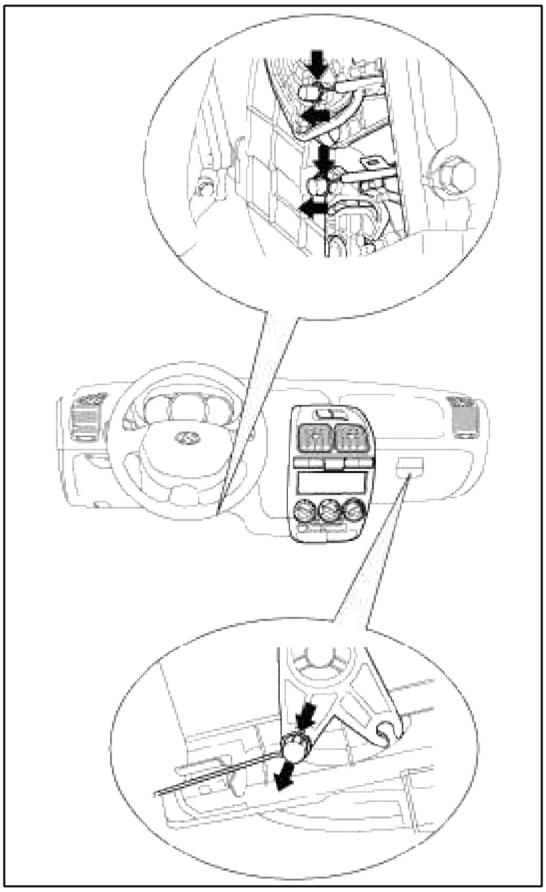
REMOVAL

1. Discharge the refrigerant.

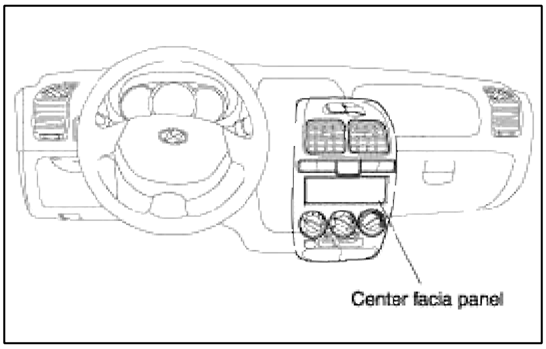
2. Remove the air conditioner suction hose, liquid tube and grommet.


Suction hose
Expansion valve
Grommet
Liquid tube

3. Remove the 2 control cables of heater side and one control cable of blower side.

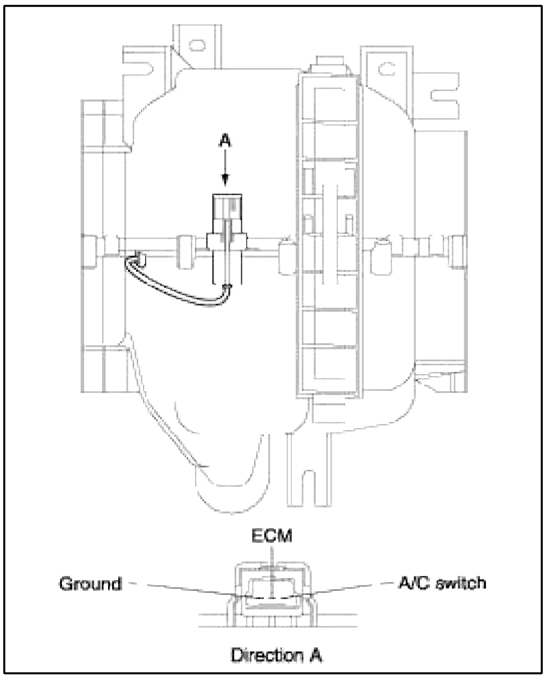


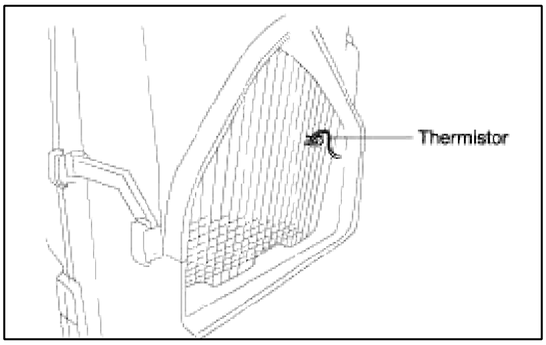
4. Remove the center facia panel from the lower portion.


Center facia panel

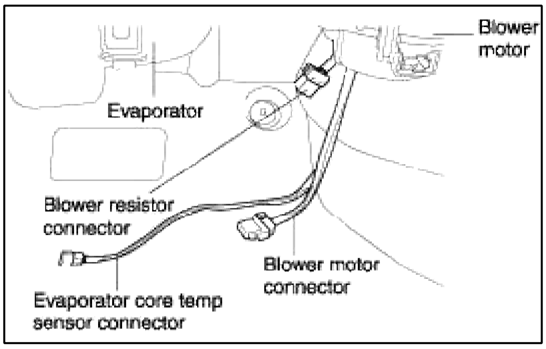
5. Disconnect the switch connectors and remove the center facia panel.
6. Loosen the mounting bolts on the main crash pad and remove the main crash pad.

7. Remove the evaporator core temp sensor (thermistor) connector.

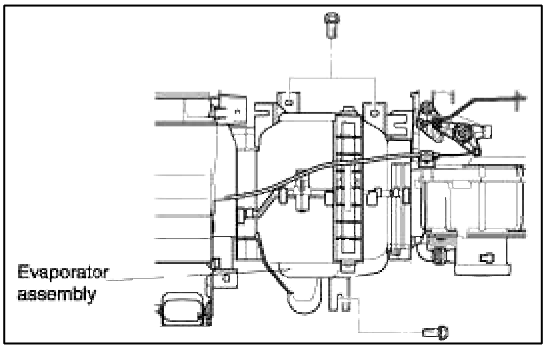

A
ECM
Ground
A/C switch
Direction A


Thermistor

8. Disconnect the blower resistor and blower motor connector.


Blower motor
Evaporator
Blower resistor connector
Blower motor connector
Evaporator core temp sensor connector

9. Remove the evaporator assembly.


Evaporator assembly

INSTALLATION

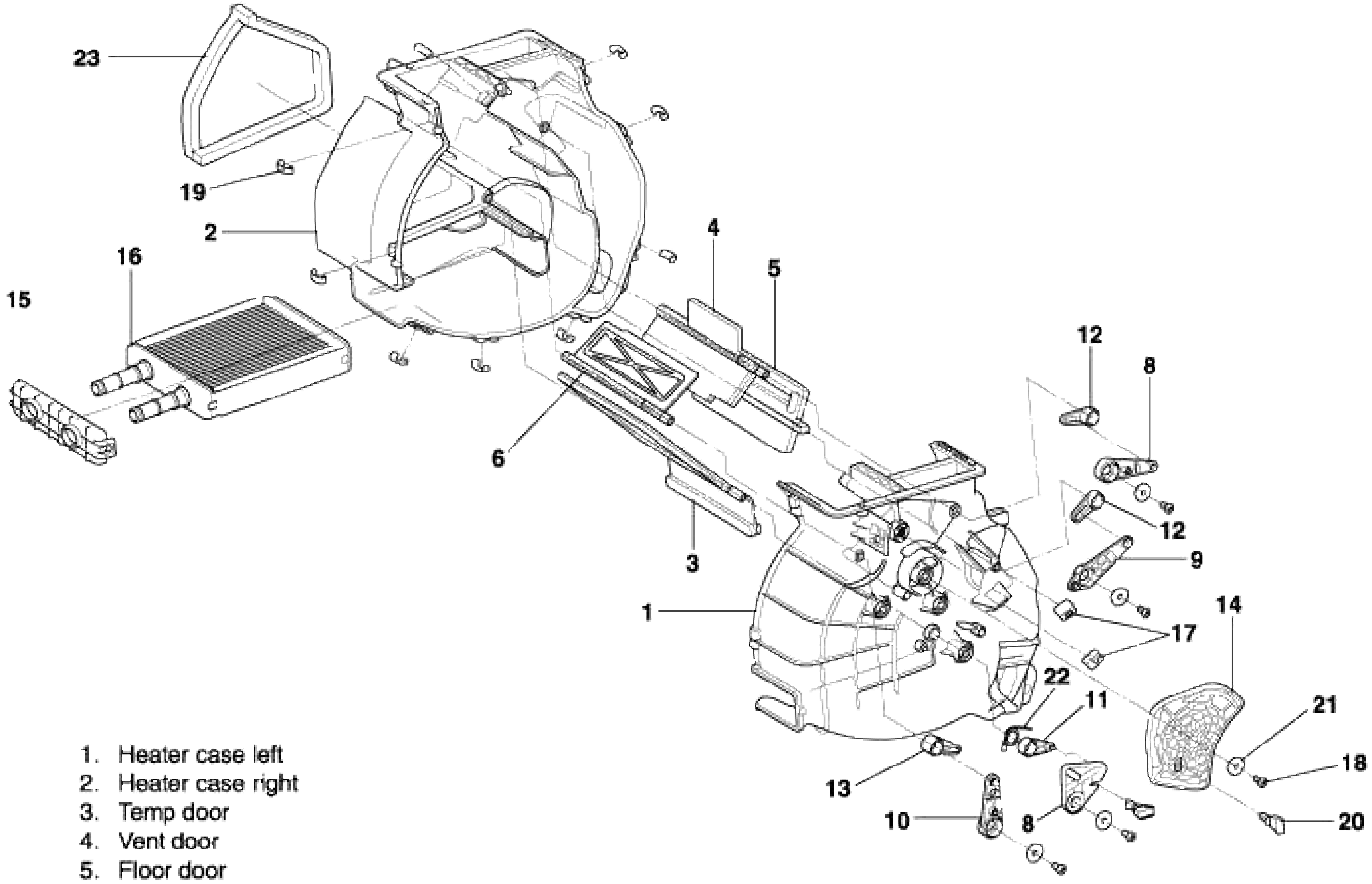
Installation is the reverse of removal.

DISASSEMBLY AND REASSEMBLY

Refer to "COMPONENTS".

Heating,Ventilation, Air Condioning > Heater > Heater Unit > Components and Components Location

COMPONENTS

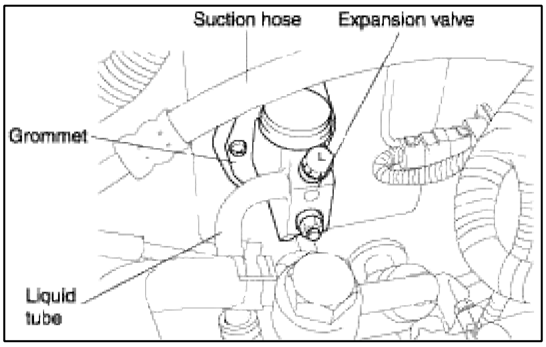


1. Heater case left
2. Heater case right
3. Temp door
4. Vent door
5. Floor door
6. Defrost door
7. Temp door lever
8. Vent door lever
9. Floor door lever
10. Defrost door lever
11. Temp door arm
12. Vent door arm
13. Defrost door arm
14. Mode cam
15. Heater core cover
16. Heater core & seal
17. Control cable clamp
18. Tapping screw
19. Clip
20. Door location key
21. Spring washer
22. Torsion spring
23. Seal

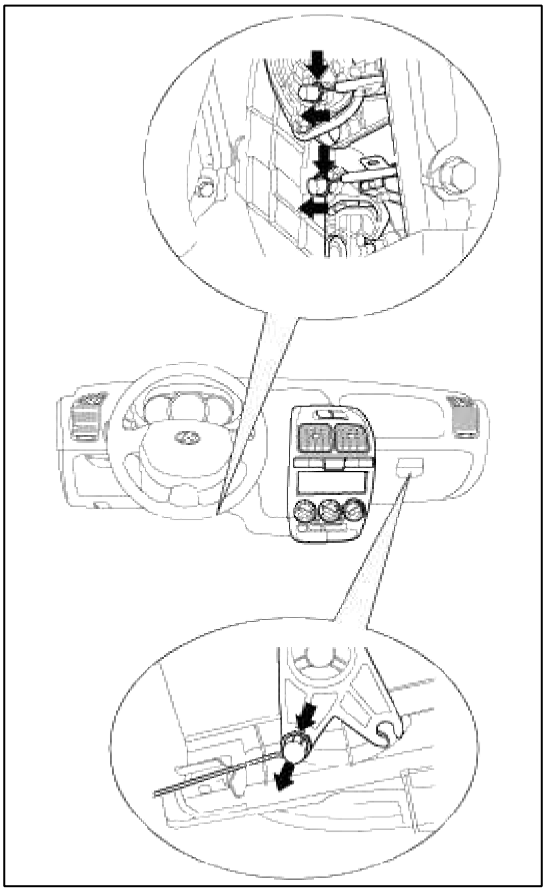
Heating,Ventilation, Air Condioning > Heater > Heater Unit > Repair procedures

REMOVAL

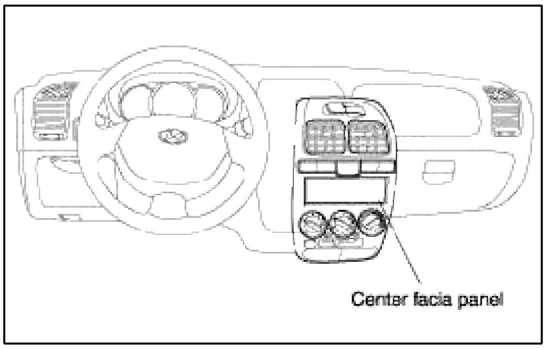
1. Disconnect the (-)negative battery terminal.
2. Drain the coolant of the radiator.
3. Remove the A/C suction hose, liquid tube and grommet.


Suction hose
Expansion valve
Grommet
Liquid tube

4. Remove the 2 heater side control cables and one blower side control cable.

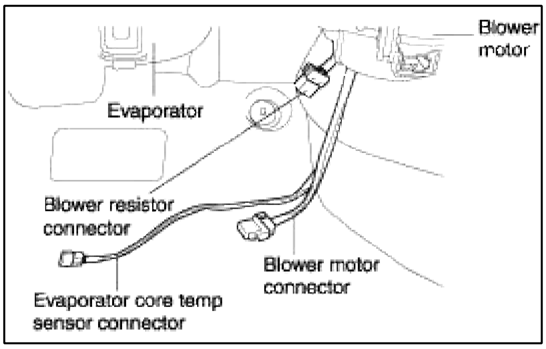


5. Remove the center facia panel from the lower portion.

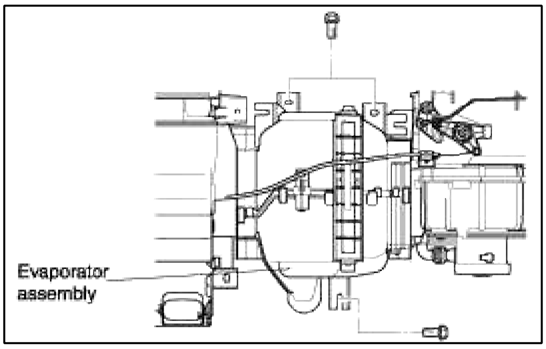

Center facia panel

6. Disconnect the switch connectors and remove the center facia panel.
7. After removing the mounting bolts, remove the main crash pad. (Refter to "CRASH PAD" of BD group)

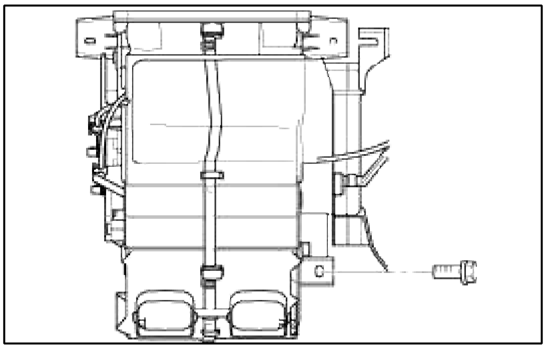
8. Disconnect the evaporator core temp sensor (thermister), blower resistor connector, and blower motor connector.


Blower motor
Evaporator
Blower resistor connector
Blower motor connector
Evaporator core temp sensor connector

9. Remove the evaporator unit.

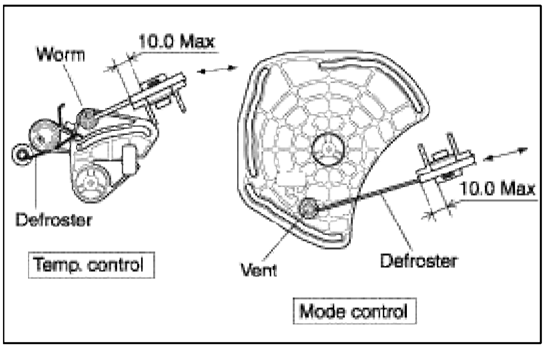

Evaporator assembly

10. Remove the heater assembly.



INSTALLATION

Installation is the reverse of removal. (Prior to installation of temp. control and mode control cables, first install the locating pin.)


Worm
10.0 Max
Defroster
Temp. control
Vent
Defroster
10.0 Max
Mode control

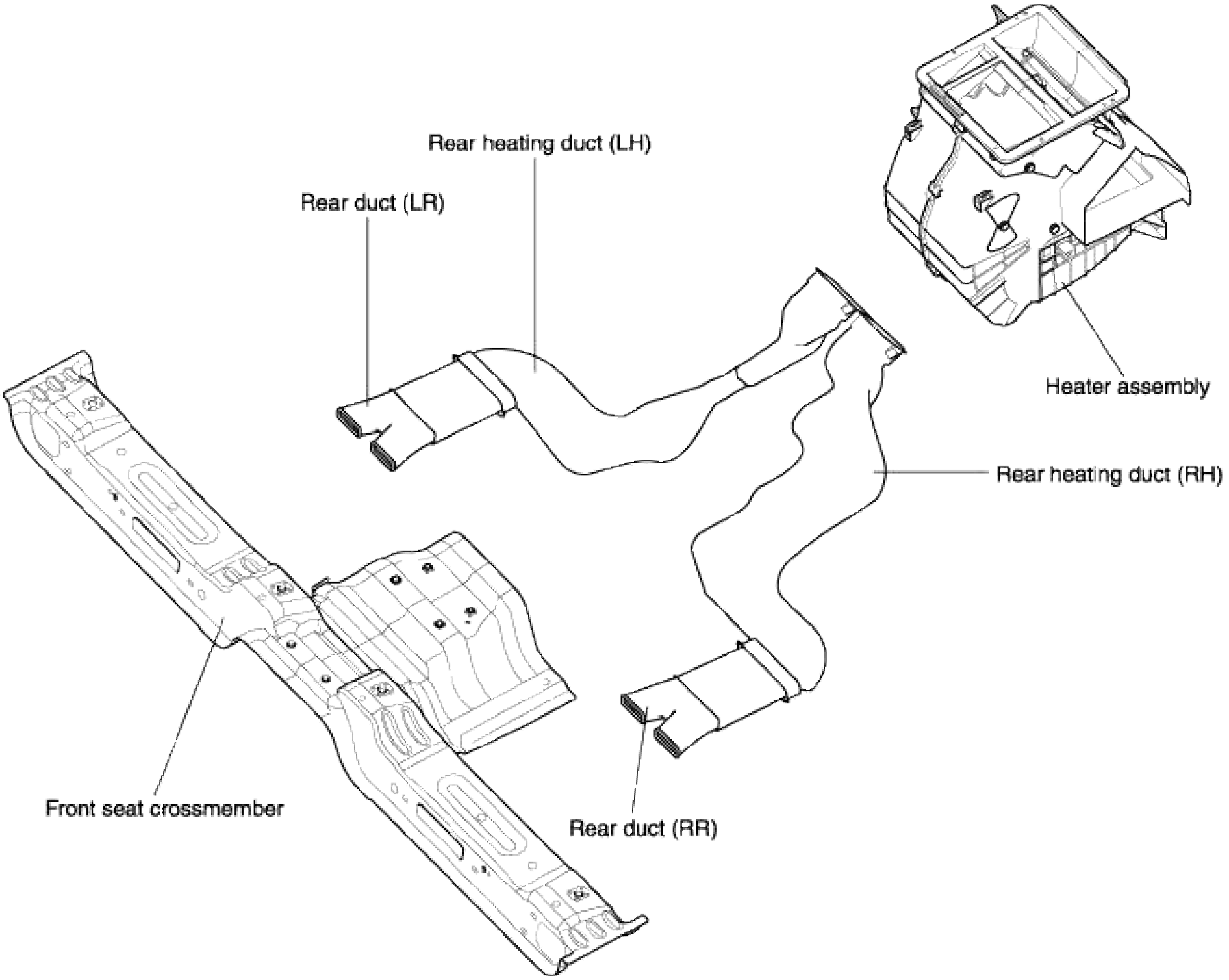
DISASSEMBLY AND REASSEMBLY

Refer to "COMPONENTS" for disassembly and reassembly. When installing and reassembling the temp. control and mode control cable, refer to the following chart.

Condition	Lever load	
	Temp. control cable	Mode control cable
Blower : 12V Mode : ALL	Max 2.0kgf	Max 2.0kgf

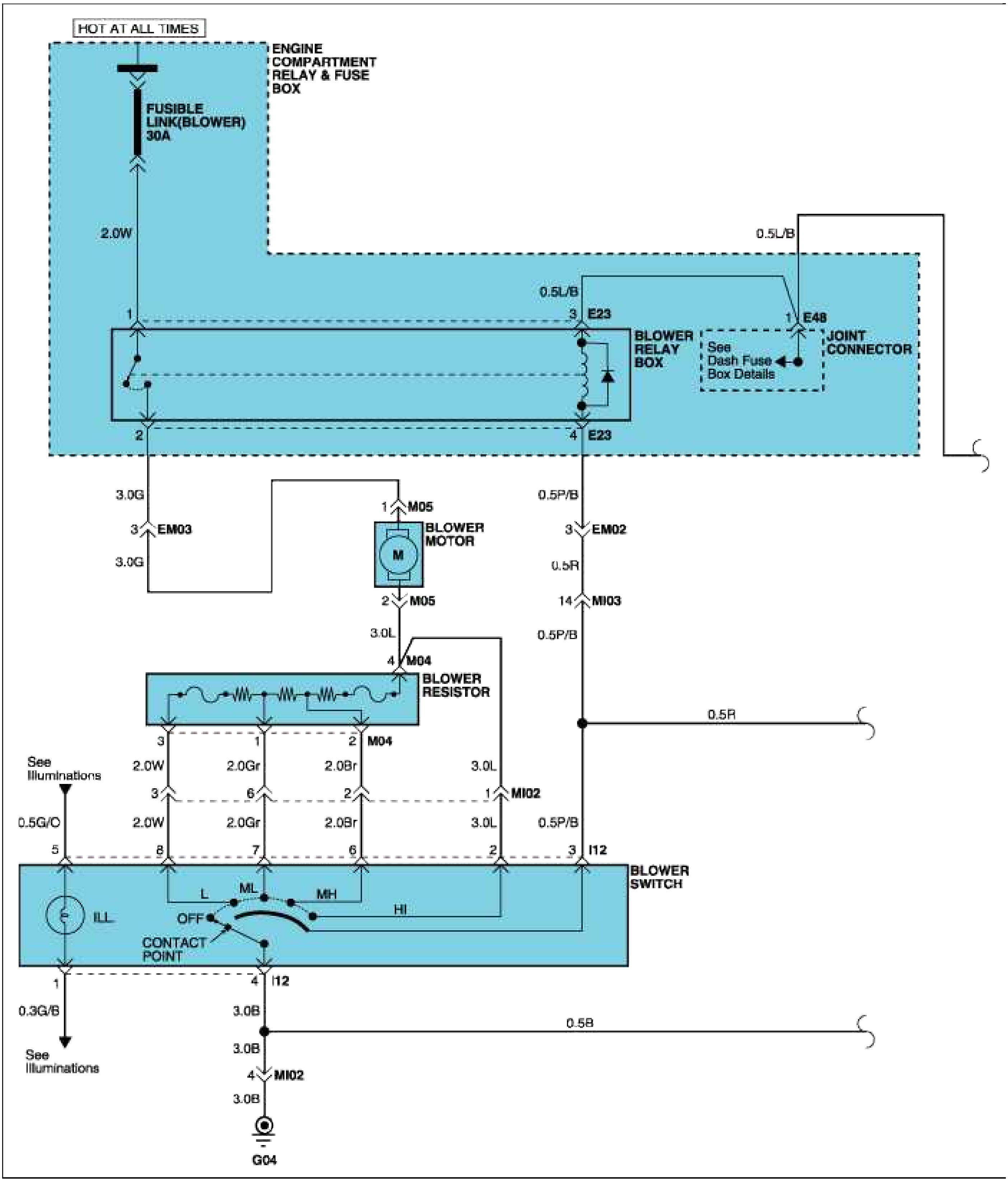
Heating,Ventilation, Air Condioning > Heater > The Other Heater Component > Components and Components Location

COMPONENTS

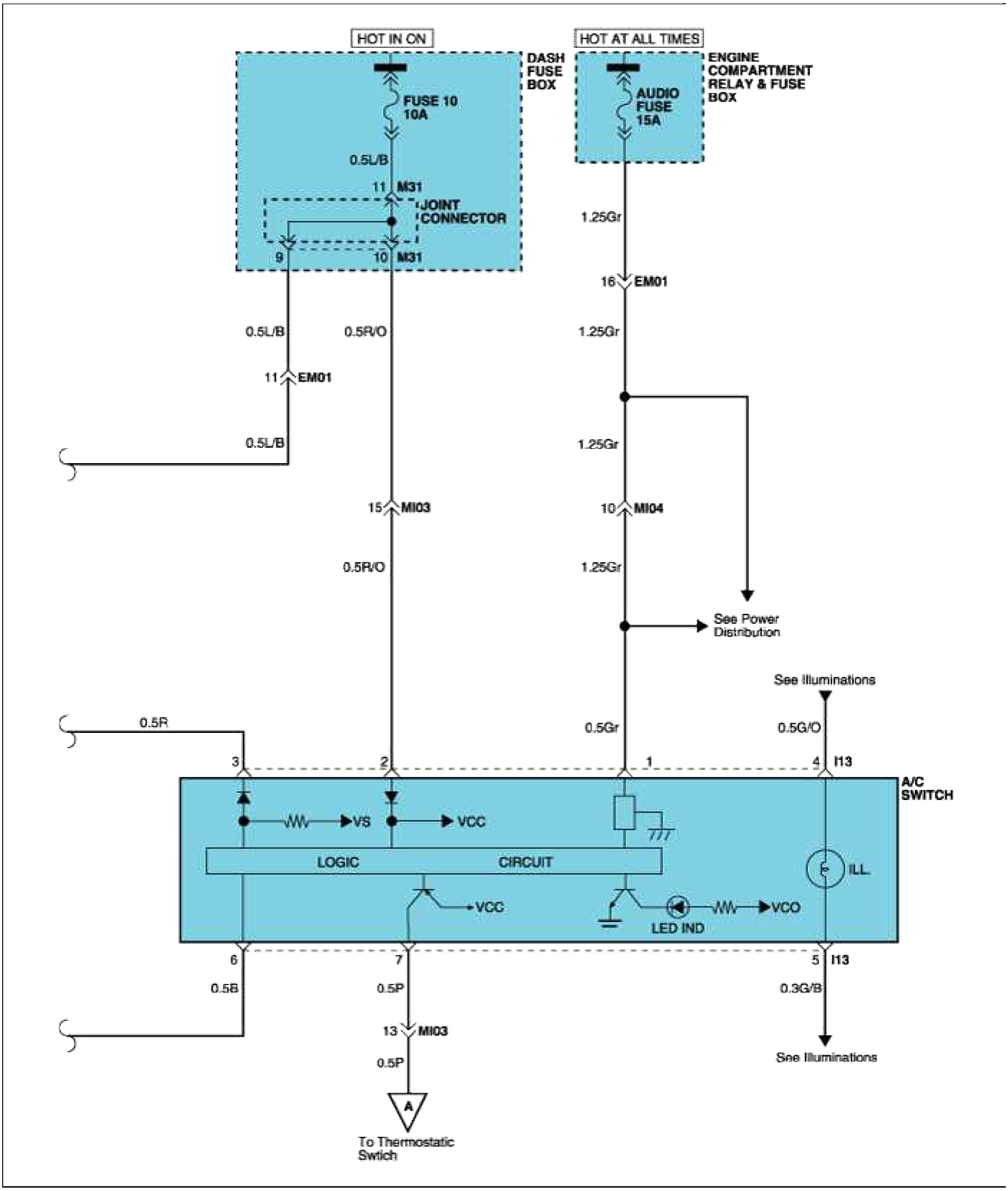

Rear heating duct (LH)
Rear duct (LR)
Heater assembly
Rear heating duct (RH)
Front seat crossmember
Rear duct (RR)

Heating,Ventilation, Air Condioning > Blower > Schematic Diagrams

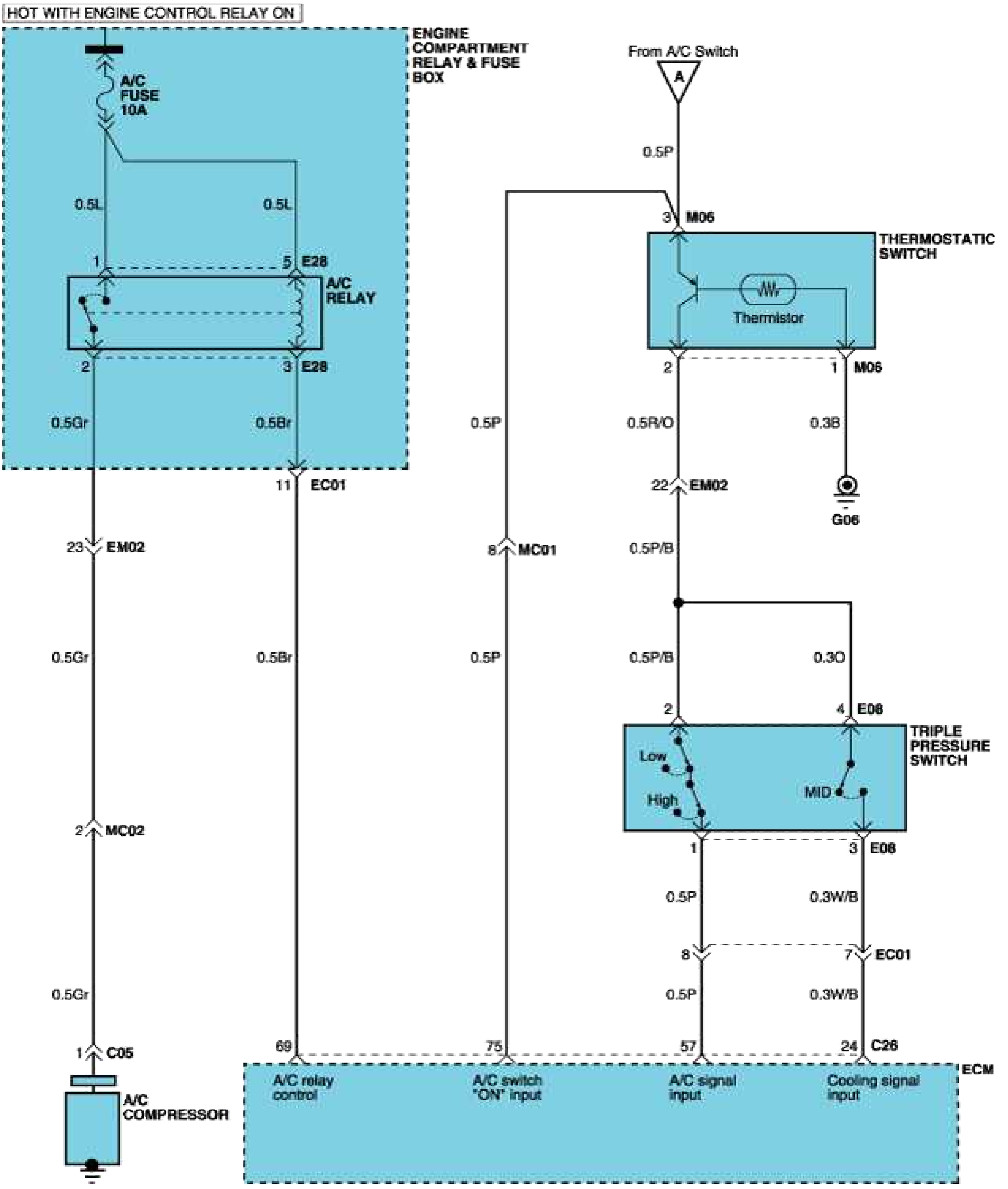
SCHEMATIC DIAGRAM (MANUAL) (1)


HOT AT ALL TIMES
ENGINE COMPARTMENT RELAY & FUSE BOX
FUSIBLE LINK(BLOWER) 30A
2.0W
0.5L/B
0.5L/B
1
3 E23
1 E48
BLOWER RELAY BOX
See Dash Fuse Box Details
JOINT CONNECTOR
2
4 E23
3.0G
3 EM03
3.0G
1 M05
BLOWER MOTOR
M
2 M05
3.0L
0.5P/B
3 EM02
0.5R
14 MI03
0.5P/B
4 M04
BLOWER RESISTOR
0.5R
3 1 2 M04
See Illuminations
2.0W
2.0Gr
2.0Br
3.0L
3 6 2 1 MI02
0.5G/O
2.0W
2.0Gr
2.0Br
3.0L
0.5P/B
5 8 7 6 2 3 I12
BLOWER SWITCH
ILL
L
ML
MH
HI
OFF
CONTACT POINT
1
4 I12
0.3G/B
3.0B
0.5B
See Illuminations
3.0B
4 MI02
3.0B
G04

SCHEMATIC DIAGRAM (MANUAL) (2)

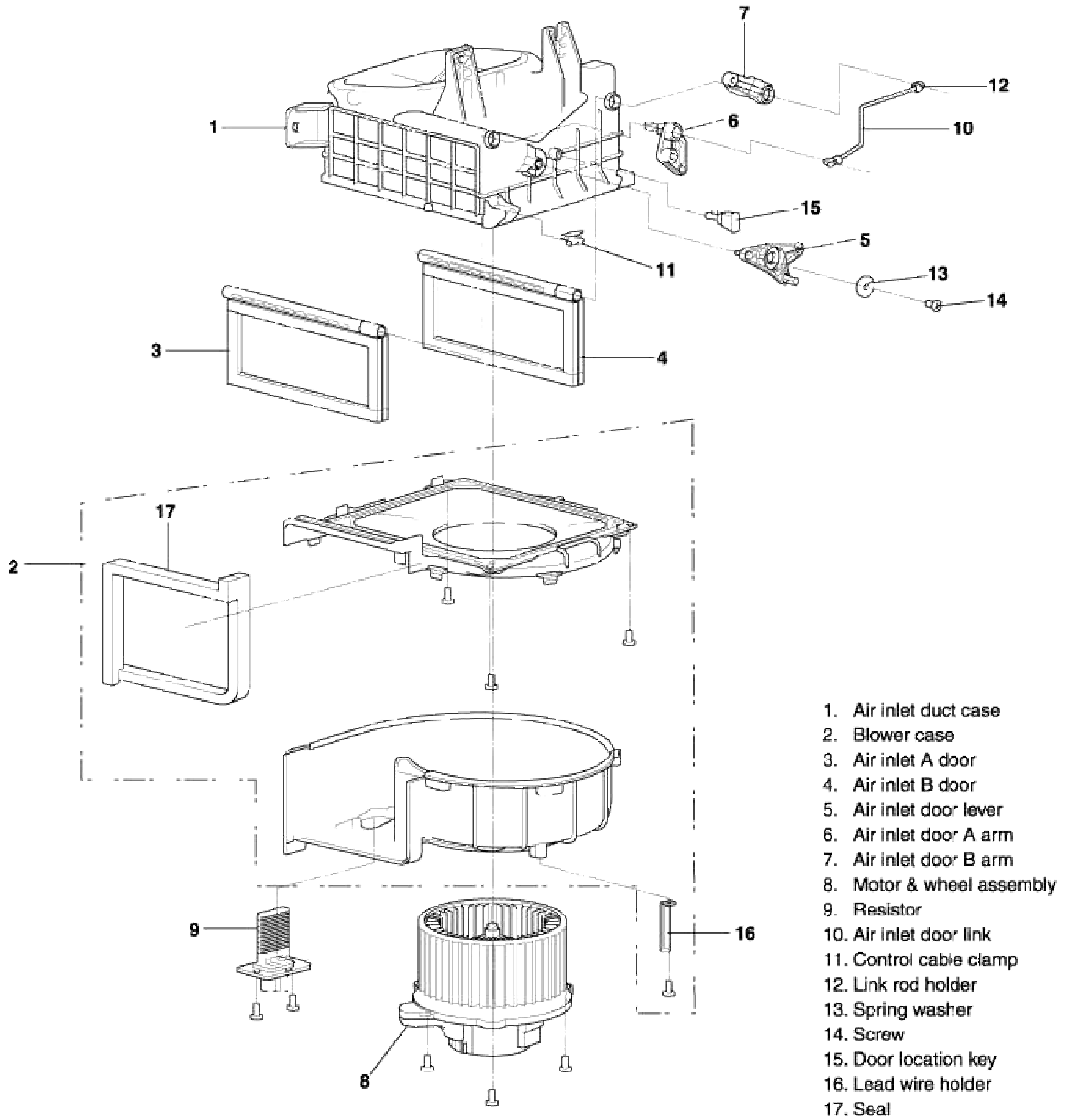

HOT IN ON
HOT AT ALL TIMES
DASH FUSE BOX
FUSE 10 10A
0.5L/B
11 M31
JOINT CONNECTOR
9
10 M31
ENGINE COMPARTMENT RELAY & FUSE BOX
AUDIO FUSE 15A
1.25Gr
16 EM01
0.5L/B
0.5R/O
1.25Gr
11 EM01
0.5L/B
1.25Gr
15 MI03
10 MI04
0.5R/O
1.25Gr
See Power Distribution
See Illuminations
0.5R
0.5Gr
0.5G/O
3
2
1
4 I13
A/C SWITCH
VS
VCC
LOGIC
CIRCUIT
ILL
VCC
LED IND
VCO
6
7
5 I13
0.5B
0.5P
0.3G/B
13 MI03
0.5P
See Illuminations
A
To Thermostatic Swtich

SCHEMATIC DIAGRAM (MANUAL) (3)


HOT WITH ENGINE CONTROL RELAY ON
ENGINE COMPARTMENT RELAY & FUSE BOX
A/C FUSE 10A
0.5L
0.5L
1
5 E28
A/C RELAY
2
3 E28
0.5Gr
0.5Br
11 EC01
23 EM02
0.5Gr
0.5Br
2 MC02
0.5Gr
1 C05
A/C COMPRESSOR
From A/C Switch
A
0.5P
3 M06
THERMOSTATIC SWITCH
Thermistor
2
1 M06
0.5P
0.5R/O
0.3B
22 EM02
G06
8 MC01
0.5P/B
0.5P
0.5P/B
0.3O
2
4 E08
TRIPLE PRESSURE SWITCH
Low
High
MID
1
3 E08
0.5P
0.3W/B
8
7 EC01
0.5P
0.3W/B
69
75
57
24 C26
ECM
A/C relay control
A/C switch "ON" input
A/C signal input
Cooling signal input

Heating,Ventilation, Air Condioning > Blower > Blower Unit > Components and Components Location

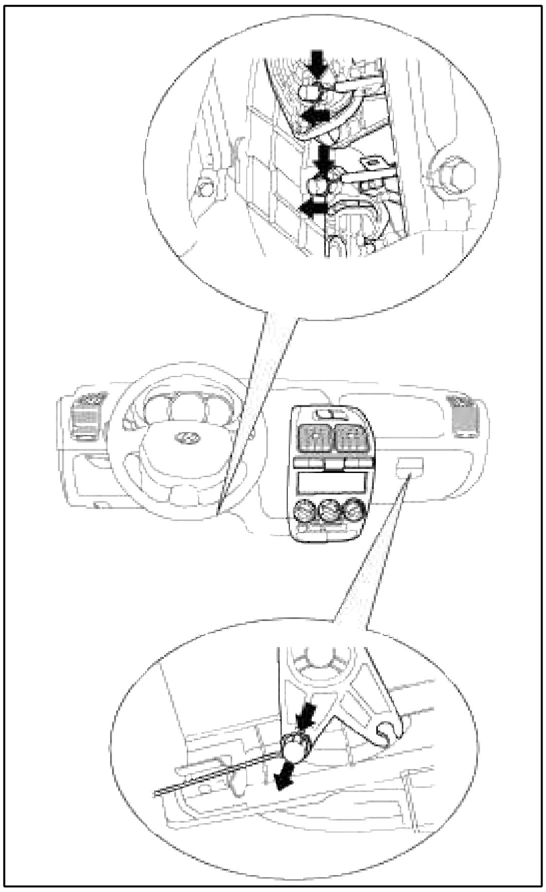
COMPONENTS


7
12
1
6
10
15
5
11
13
14
3
4
17
2
9
16
8
1. Air inlet duct case
2. Blower case
3. Air inlet A door
4. Air inlet B door
5. Air inlet door lever
6. Air inlet door A arm
7. Air inlet door B arm
8. Motor & wheel assembly
9. Resistor
10. Air inlet door link
11. Control cable clamp
12. Link rod holder
13. Spring washer
14. Screw
15. Door location key
16. Lead wire holder
17. Seal

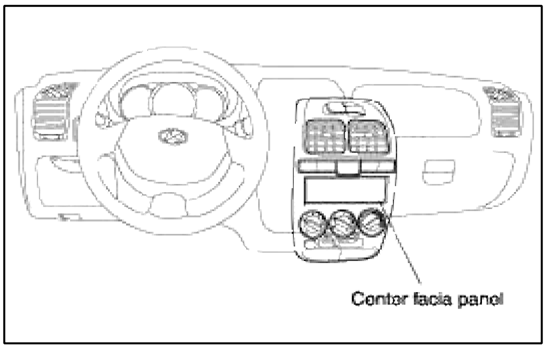
Heating,Ventilation, Air Condioning > Blower > Blower Unit > Repair procedures

REMOVAL

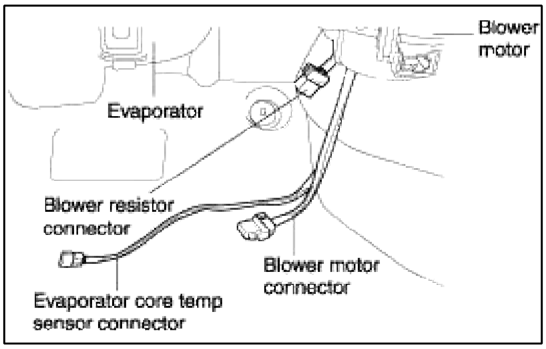
1. Remove the 2 heater side control cables and one blower side control cable.



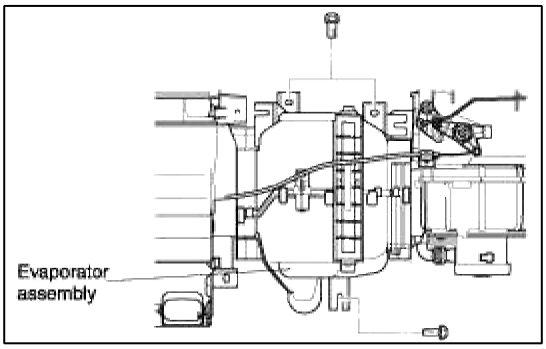
2. Remove the center facia panel from the lower portion.


Center facia panel

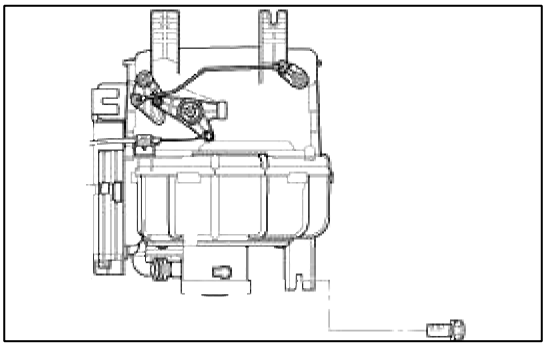
3. Disconnect the switch connectors and remove the center facia panel.
4. After removing the mounting bolts, remove the main crash pad. (Refer to "CRASH PAD" of BD guoup)
5. Disconnect the evaporator core temp sensor (thermister), blower resistor connector, and motor connector.


Blower motor
Evaporator
Blower resistor connector
Blower motor connector
Evaporator core temp sensor connector

6. Remove the evaporator unit.

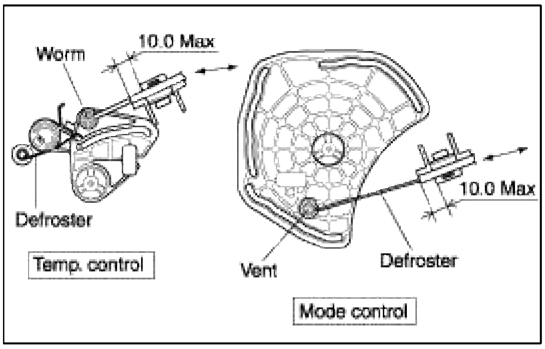

Evaporator assembly

7. Remove the blower unit.



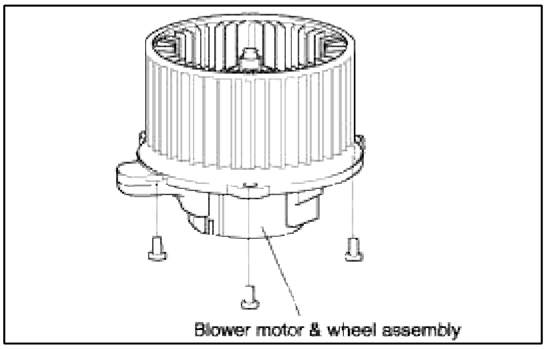
INSTALLATION

Installation is the reverse of removal. (Prior to installation of intake and exhaust cables, install the locating pin)

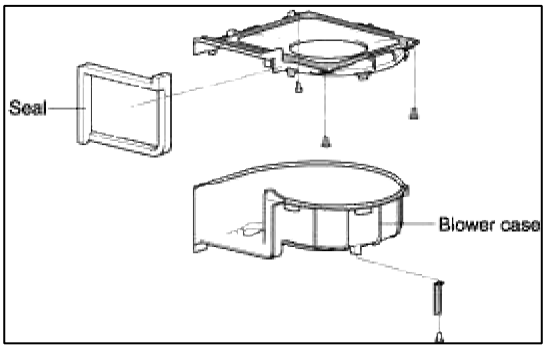

Worm
10.0 Max
Defroster
Temp. control
10.0 Max
Vent
Defroster
Mode control

DISASSEMBLY AND REASSEMBLY

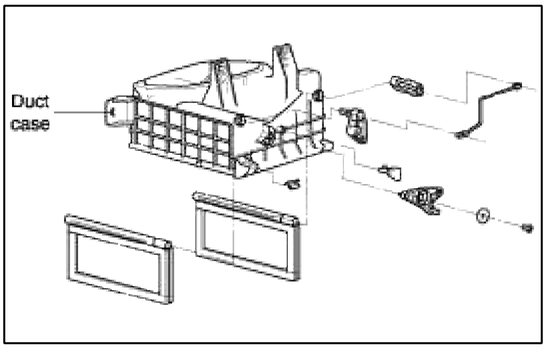
1. Loosen the motor mounting screw.


Blower motor & wheel assembly

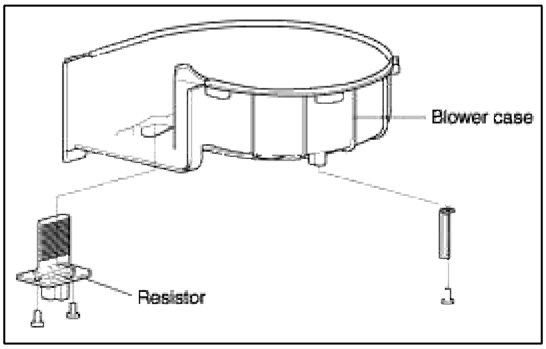
2. Loosen the duct and blower case mounting screw.



3. Disconnect the door lever and arm.



4. Remove the blower resistor.



5. Reassembly is the reverse of disassembly.

Heating,Ventilation, Air Condioning > Blower > Blower Motor > Repair procedures

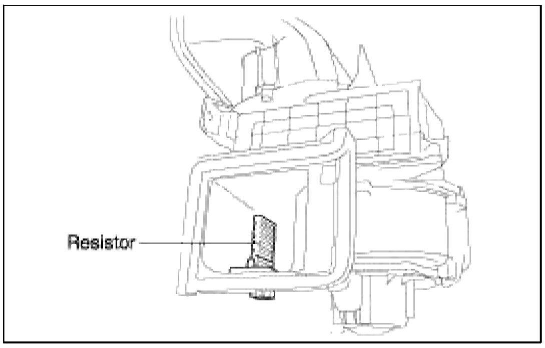
INSPECTION

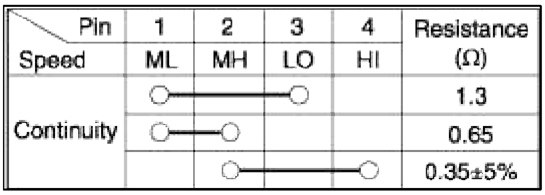
1. Check the blower motor shaft for bend.
2. Check the packing portion for crack.
3. Check the fan for damage.
4. Check the blower case for damage.
5. Check for the air selection damper operation.
6. Connect the blower motor to the battery and check for smooth operation.
7. Connect the blower motor to the opposite poles of battery and check for reverse operation.

Heating,Ventilation, Air Condioning > Blower > Blower Resistor > Repair procedures

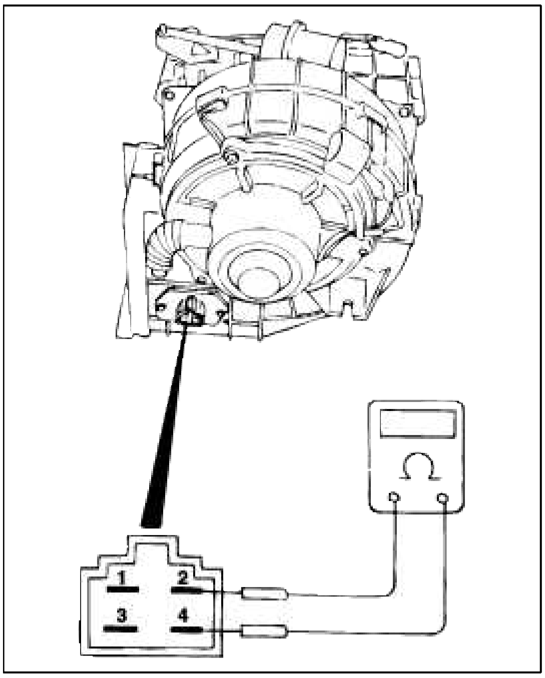
INSPECTION

Measure the resistance between terminals and replace the blower resistor if the measured value is not within the specified range.



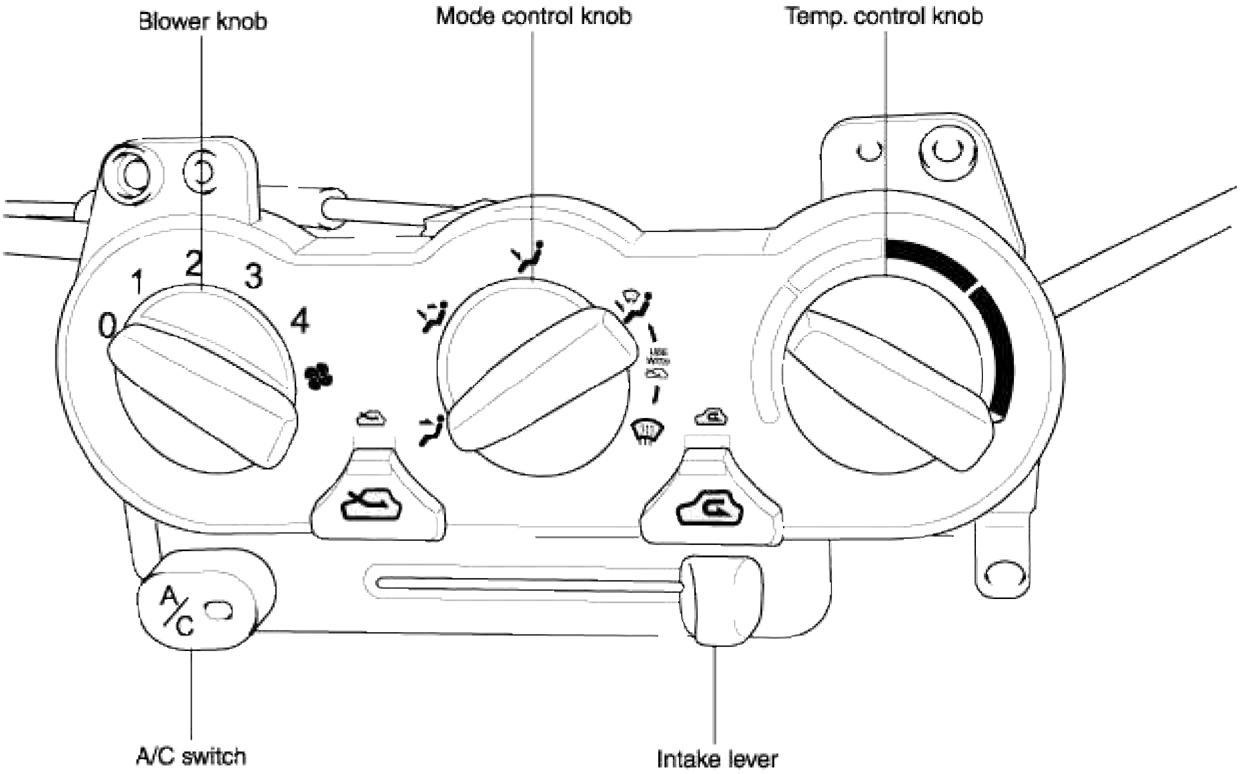


Pin Speed	1 ML	2 MH	3 LO	4 HI	Resistance (Ω)
Continuity	○		○		1.3
	○	○			0.65
		○		○	0.35±5%

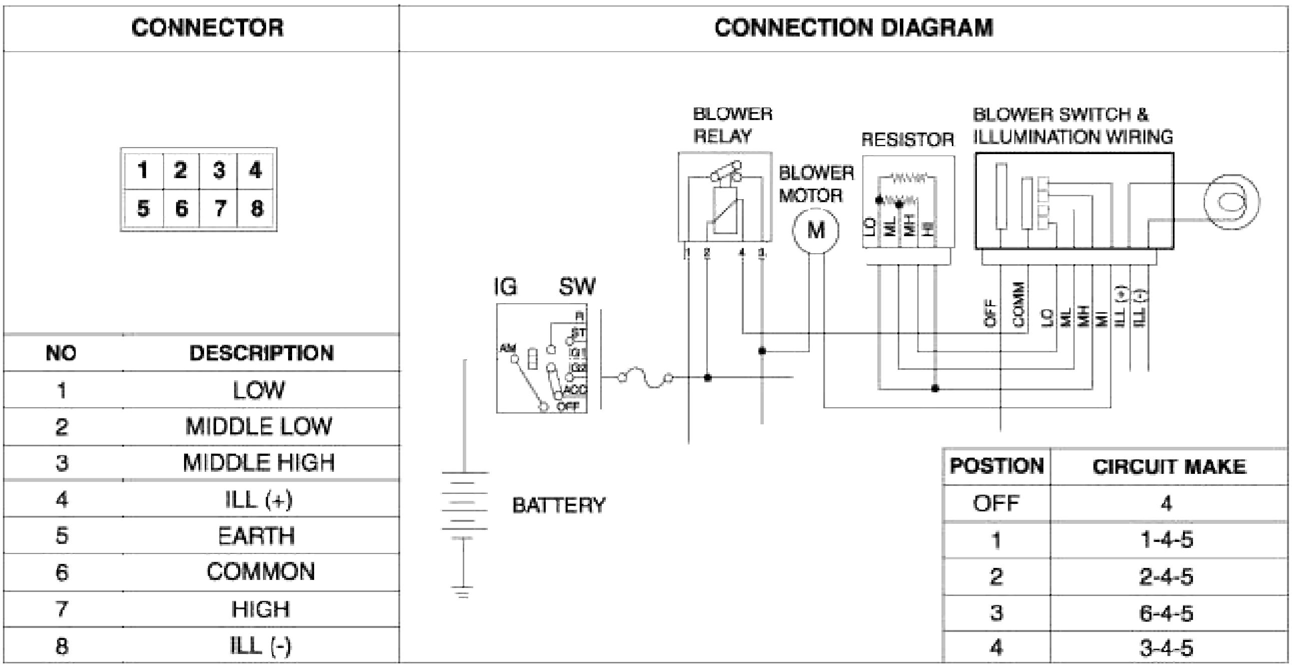


Heating,Ventilation, Air Condioning > Blower > Control Panel > Components and Components Location

COMPONENTS


Blower knob
Mode control knob
Temp. control knob
0
1
2
3
4
A/C
A/C switch
Intake lever

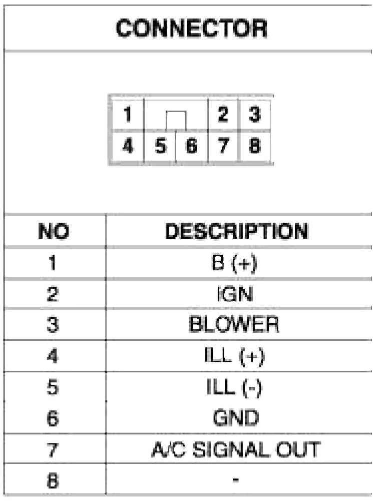
BLOWER SWITCH CONNECTOR & CONNECTION DIAGRAM


CONNECTOR
1 2 3 4
5 6 7 8
CONNECTION DIAGRAM
BLOWER RELAY
RESISTOR
BLOWER SWITCH & ILLUMINATION WIRING
BLOWER MOTOR
M
LO
ML
MH
HI
IG SW
AM
ST
IG1
IG2
ACC
OFF
BATTERY
OFF
COMM
LO
ML
MH
MI
ILL (+)
ILL (-)

NO	DESCRIPTION
1	LOW
2	MIDDLE LOW
3	MIDDLE HIGH
4	ILL (+)
5	EARTH
6	COMMON
7	HIGH
8	ILL (-)

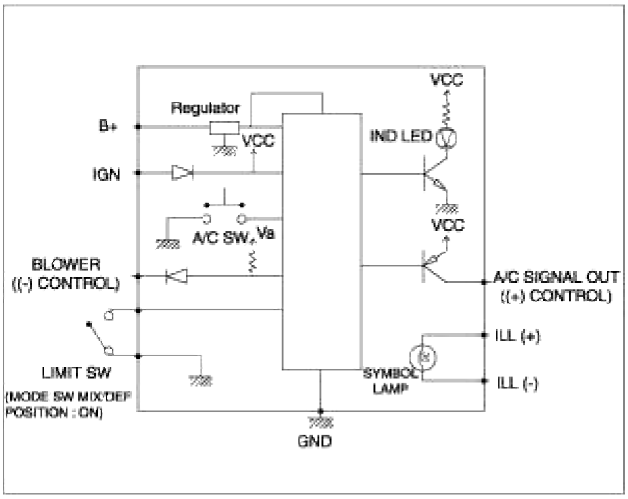
POSTION	CIRCUIT MAKE
OFF	4
1	1-4-5
2	2-4-5
3	6-4-5
4	3-4-5

A/C SWITCH & DEFROSTER SWITCH CONNECTOR


CONNECTOR
1 2 3
4 5 6 7 8

NO	DESCRIPTION
1	B (+)
2	IGN
3	BLOWER
4	ILL (+)
5	ILL (-)
6	GND
7	A/C SIGNAL OUT
8	-

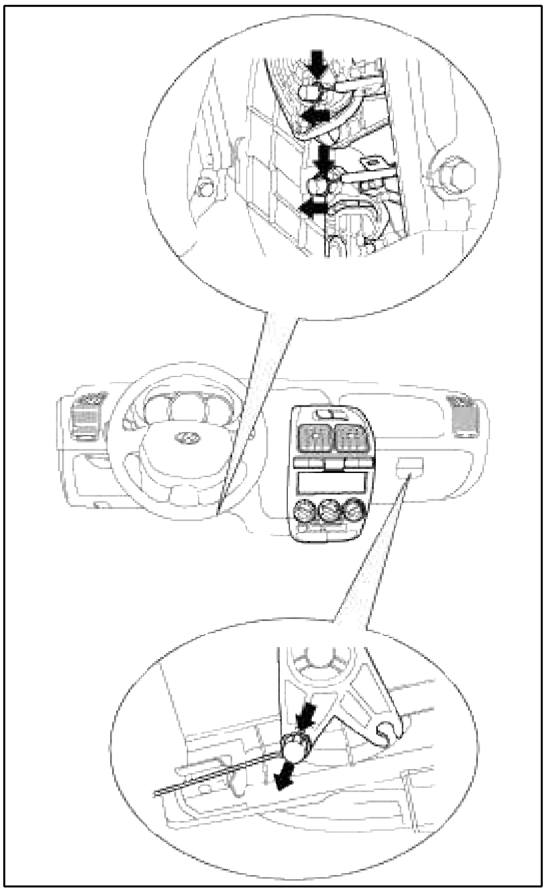
A/C SWITCH DIAGRAM


VCC
Regulator
B+
VCC
IND LED
IGN
VCC
A/C SW
Va
BLOWER
((-) CONTROL)
A/C SIGNAL OUT
((+) CONTROL)
ILL (+)
LIMIT SW
(MODE SW MIX/DEF
POSITION : ON)
SYMBOL
LAMP
ILL (-)
GND

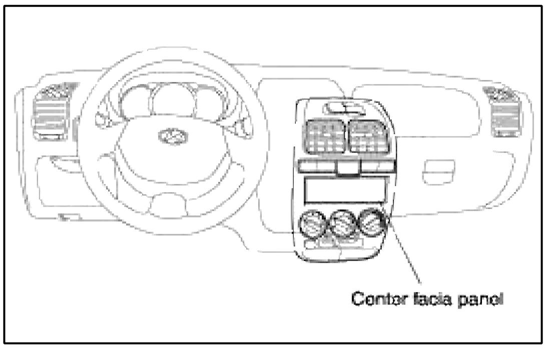
Heating,Ventilation, Air Condioning > Blower > Control Panel > Repair procedures

REMOVAL AND INSTALLATION

1. Remove the 2 control cables in the heater side and one control cable in the blower side.



2. Remove the center facia panel from the lower portion.



3. Disconnect the switch connectors and remove the center facia panel.
4. Installation is the reverse of removal.

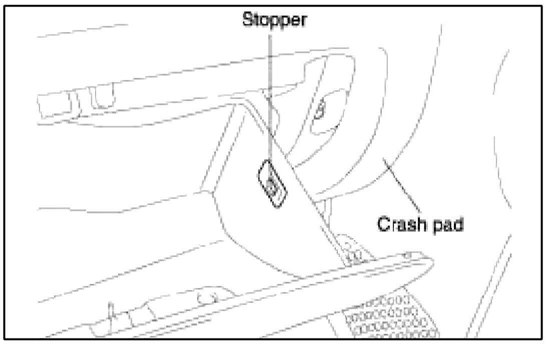
DISASSEMBLY AND REASSEMBLY

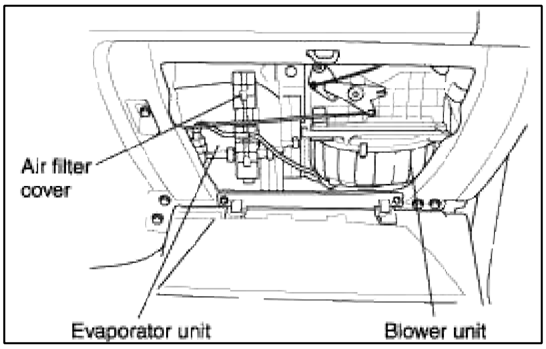
Refer to "COMPONENTS".

Heating,Ventilation, Air Condioning > Blower > Air cleaner filter > Repair procedures

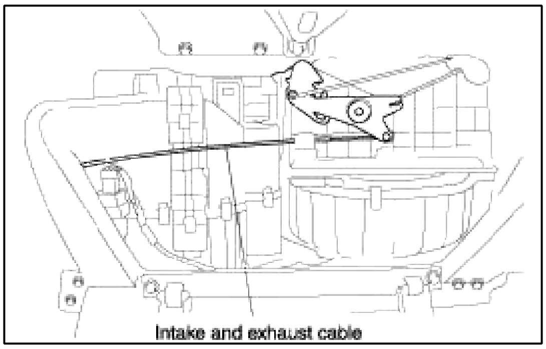
REPLACEMENT

1. Open the glove box, remove the glove box stopper in the lower crash pad (assist seat side), and completely lower the glove box.

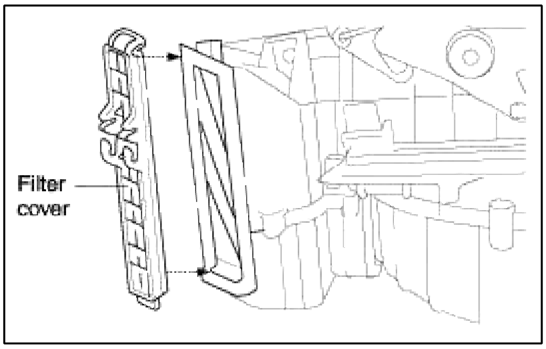

Stopper
Crash pad


Air filter cover
Evaporator unit
Blower unit

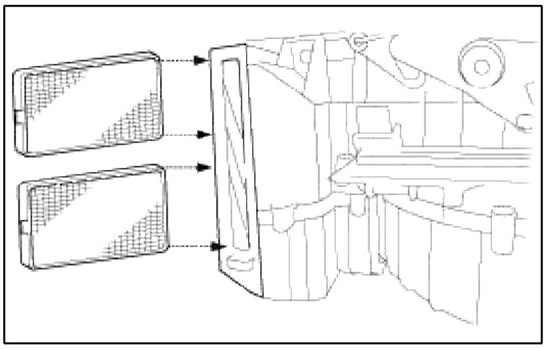
2. Disconnect the intake and exhaust cable from the blower unit.


Intake and exhaust cable

3. Press the hook on the air conditioner side air filter cover and remove the cover.

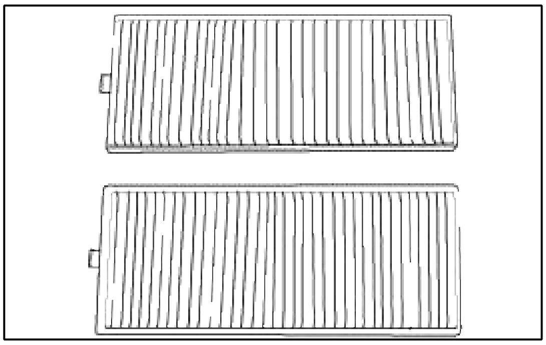

Filter cover

4. Replace the upper/lower air filters.



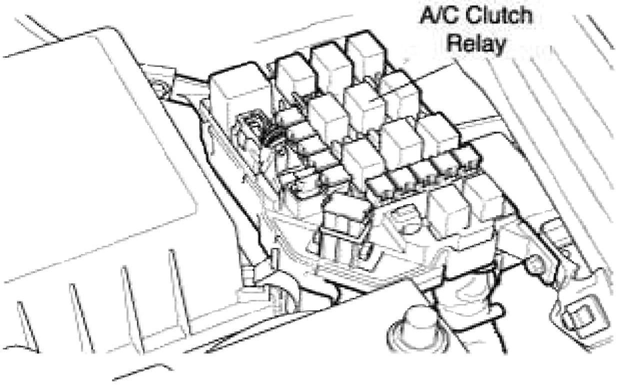
NOTE

When removing and installing, don't forget there are 2 air filters in the air conditioner.



Heating,Ventilation, Air Condioning > Troubleshooting > P0645

COMPONENT LOCATION



GENERAL DESCTIPTION

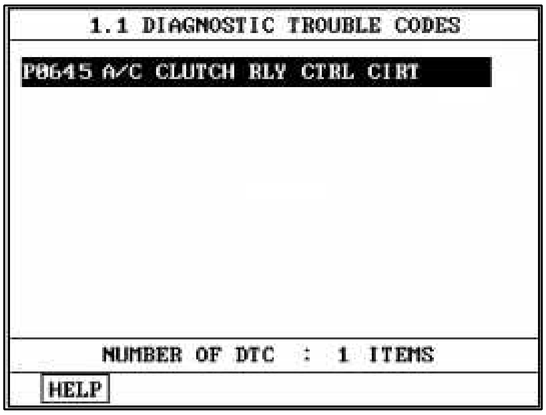
DTC DESCRIPTION

DTC DETECTING CONDITION

Item	Detecting Condition	Possible cause
Monitoring Strategy	● Circuit continuity check	● Open in battery and control circuit ● Short to ground in control circuit (pin 69 to GND) ● Short to battery in control circuit ● Faulty A/C Relay ● Faulty PCM
Threshold value	● Short to GND or disconnected	
Enable Conditions	● Cooling fan control enabled	
Diagnostic Time		
Fail Safe		

MONITOR DTC STATUS

1. Connect scantool to Data Link Connector(DLC).
2. Warm up the engine to normal operating temperature.
3. Monitor the "A/C Relay" parameter on the scantool.



```
1.1 DIAGNOSTIC TROUBLE CODES
P0645 A/C CLUTCH RLY CTRL CIRT

NUMBER OF DTC : 1 ITEMS
```

NOTE

The data shown above is only for reference and there may be a little difference actually.

Service standard

4. Is parameter displayed within specifications?

YES

Fault is intermittent caused by poor contact in the sensor's and/or PCM's connector or was repaired and PCM memory was not cleared.Thoroughly check connectors for looseness, poor connection, bending, corrosion,contamination,deterioration, or damage. Repair or replace as necessary and then go to "Verification of Vehicle Repair" proceduredure.

NO

Go to "W/Harness Inspection" procedure.

TERMINAL & CONNECTOR INSPECTION

1. Many malfunctions in the electrical system are caused by poor harness and terminals. Faults can also be caused by interference from other electrical systems, and mechanical or chemical damage.
2. Thoroughly check connectors for looseness, poor connection, bending, corrosion, contamination,deterioration, or damage.
3. Has a problem been found?

YES

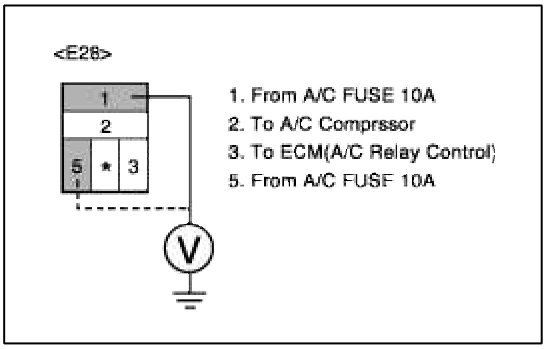
Repair as necessary and go to "Verification of vehicle Repair" procedure.

NO

Go to "Power Circuit inspection" procedure.

POWER CIRCUIT INSPECTION

1. Check for open in harness
   (1) Ignition "OFF"
   (2) Disconnect A/C Relay.
   (3) Ignition "ON" & Engine "OFF"
   (4) Measure voltage between terminal 1 and 5 of A/C Relay harness connector and chassis ground.


<E28>
1
2
5
*
3
V
1. From A/C FUSE 10A
2. To A/C Comprssor
3. To ECM(A/C Relay Control)
5. From A/C FUSF 10A

   (5) Is measure voltage within Specification?

YES

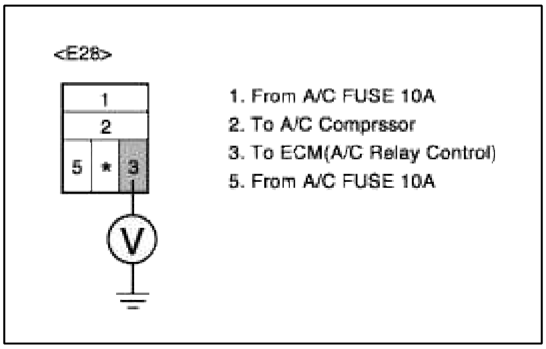
Go to "Control circuit insepction" procedure.

NO

Open circuit or short circuit to chassis ground between A/C Relay harness connector and A/C FUSE 10A Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

CONTROL CIRCUIT INSPECTION

1. Ignition "OFF"
2. Disconnect A/C Relay.
3. Ignition "ON" & Engine "OFF"
4. Measure voltage between terminal 3 of A/C Relay harness connector and chassis ground.


<E28>
1
2
5
*
3
V
1. From A/C FUSE 10A
2. To A/C Comprssor
3. To ECM(A/C Relay Control)
5. From A/C FUSE 10A

5. Is measure voltage within Specification?

YES

Go to "Component Inspection" procedure.

NO

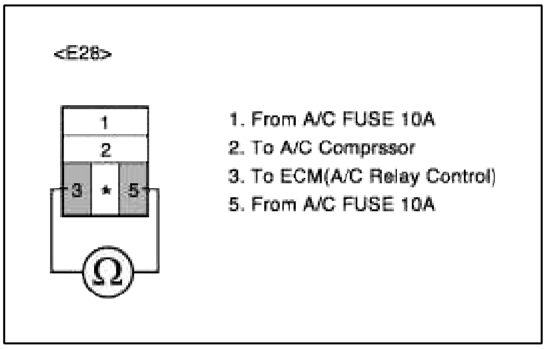
Check for open or Short to battery in control circuit.
Check for open or Short to ground in control circuit.
Repair as necessary and then go to "Verification of Vehicle Repair" procedure.

NOTE

1. In case,when A/C Relay connector is disconnected,the voltage at terminal 3 is 12V.
   Possible cause : Short to battery in control circuit
2. In case,when A/C Relay connector is disconnected,the voltage at terminal 3 is 0V.
   Possible cause : Short to ground in control circuit

COMPONENT INSPECTION

1. Check A/C Relay
   (1) Ignition "OFF"
   (2) Disconnect A/C Relay.
   (3) Measure resistance between terminal 3 and 5 of A/C Relay connector(To sensor side)



(4) Is measure resistance within Specification?

YES

Substitute with a known-good PCM and check for proper operation. If the problem is corrected, replace PCM and then go to "Verification of Vehicle Repair" procedure.

NO

Substitute with a known-good A/C Relay heater and check for proper operation. If the problem is corrected, replace A/C Relay and then go to "Verification of Vehicle Repair" procedure.

VERIFICATION OF VEHICLE REPAIR

1. Monitor and record the Freeze Frame Data for the Diagnostic Trouble Code (DTC) which has been diagnosed.
2. Using a Scantool, Clear the DTCs.
3. Operate the vehicle within conditions noted in the freeze frame data or enable conditions.
4. Monitor that all rediness test have been verified as "Complete"

5. Are any DTCs present ?

YES

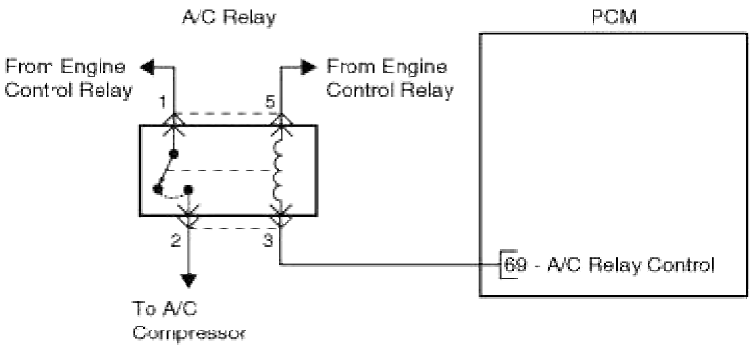
Go to the applicable troubleshooting procedure.

NO

System is performing to specification at this time.

SCHEMATIC DIAGRAM

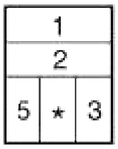
[CIRCUIT DIAGRAM]


A/C Relay
PCM
From Engine Control Relay
From Engine Control Relay
1
5
2
3
To A/C Compressor
69 - A/C Relay Control

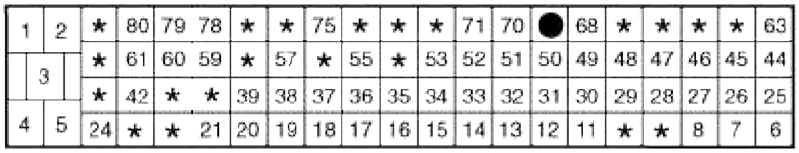
[CONNECTION INFORMATION]

Terminal	Connected to	Function
1	Battery	Battery Voltage
2	A/C Compressor	Battery Voltage
3	PCM Terminal 69	A/C Relay Control
5	Battery	Battery Voltage

[HARNESS CONNECTORS]



A/C Relay


1 2 ★ 80 79 78 ★ ★ 75 ★ ★ ★ 71 70 ● 68 ★ ★ ★ ★ 63
3 ★ 61 60 59 ★ 57 ★ 55 ★ 53 52 51 50 49 48 47 46 45 44
★ 42 ★ ★ 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25
4 5 24 ★ ★ 21 20 19 18 17 16 15 14 13 12 11 ★ ★ 8 7 6

PCM

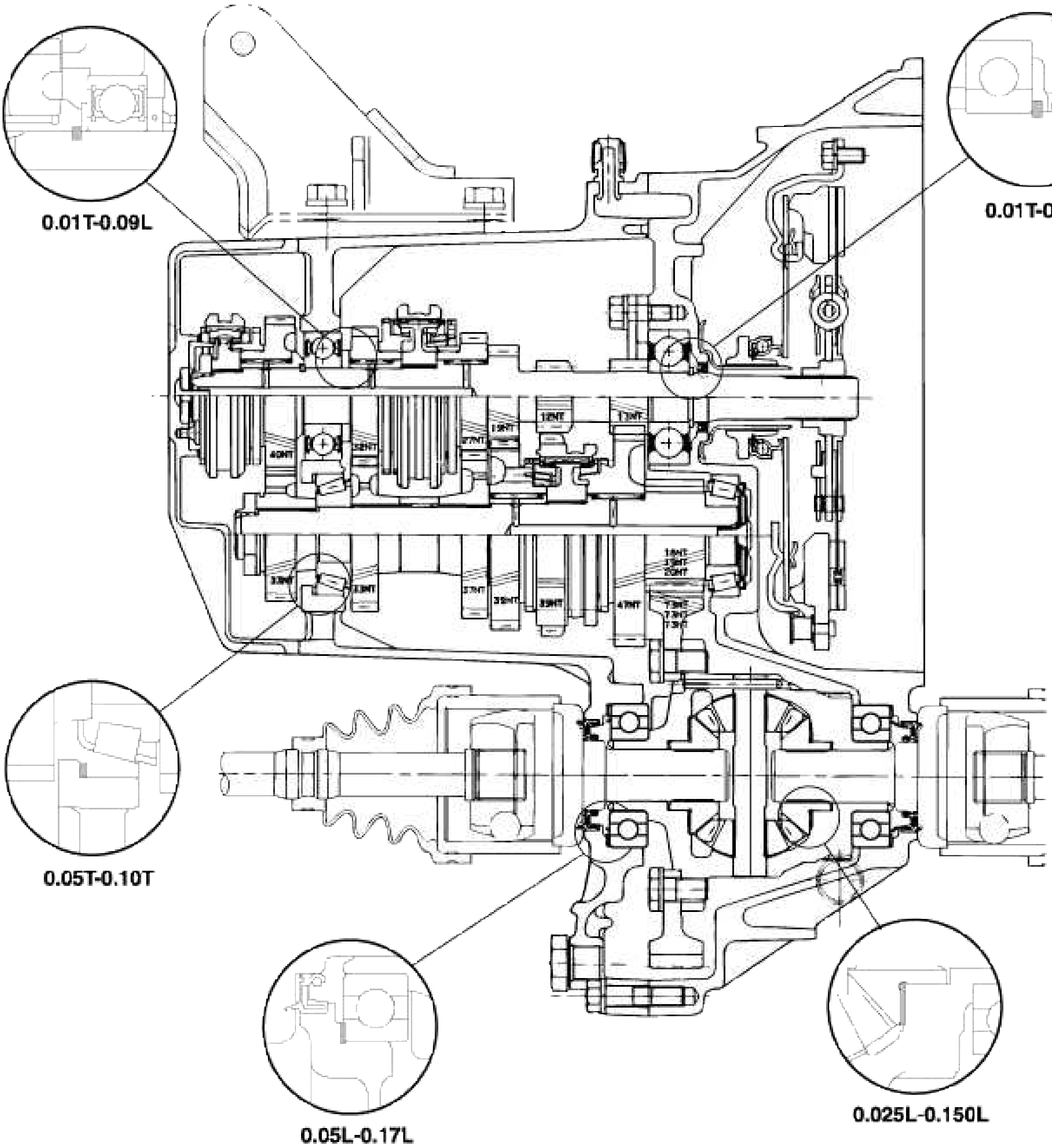
ACCENT(LC) > 2005 > G 1.5 SOHC > Manual Transaxle System

Manual Transaxle System > Manual Transaxle System > Components and Components Location

GENERAL INFORMATION (M5AF3)

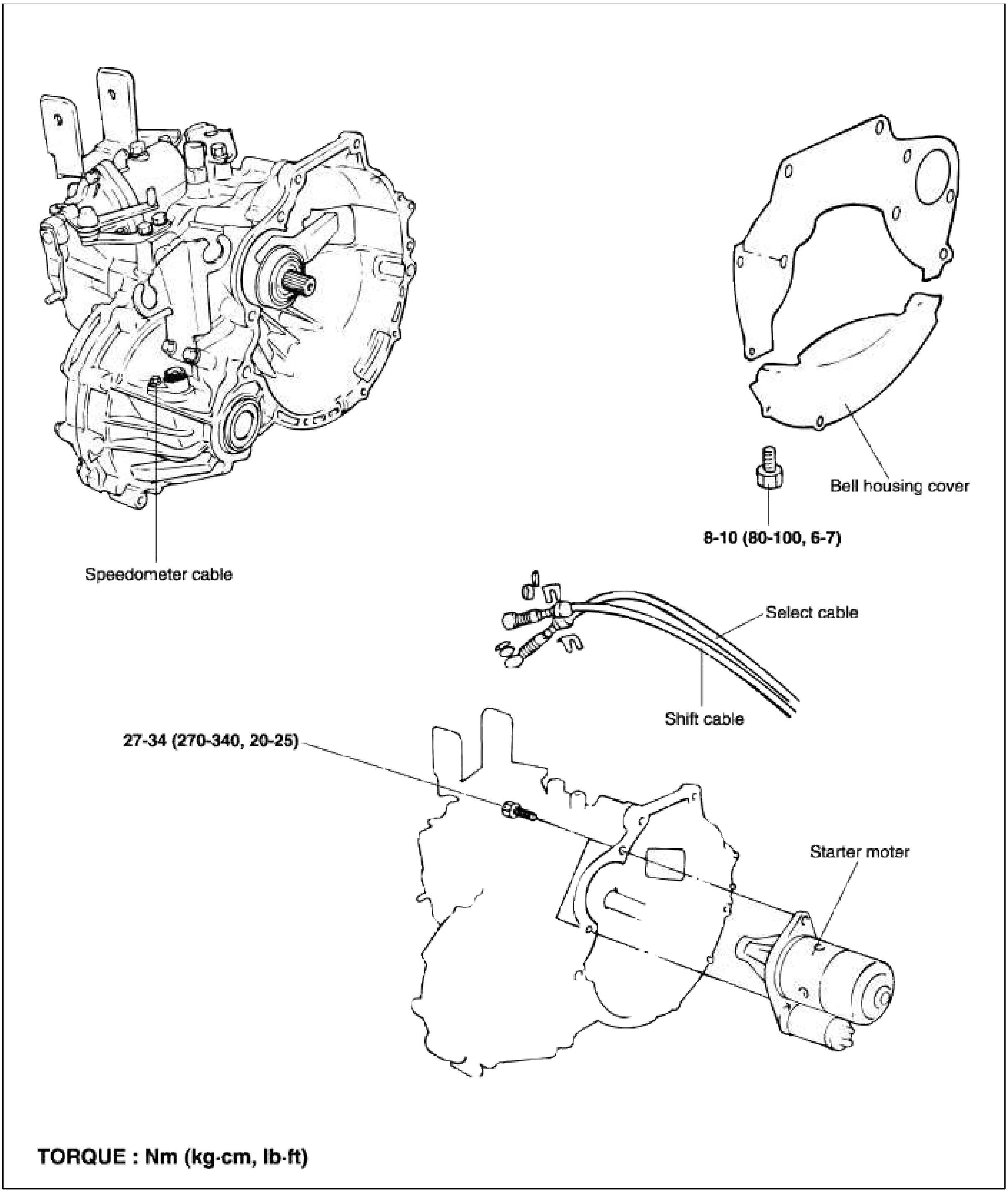
Manual transaxle overhaul section has been separated from the shop manual.
M5AF3 overhaul section was included in the overhaul manual.

SECTION VIEW

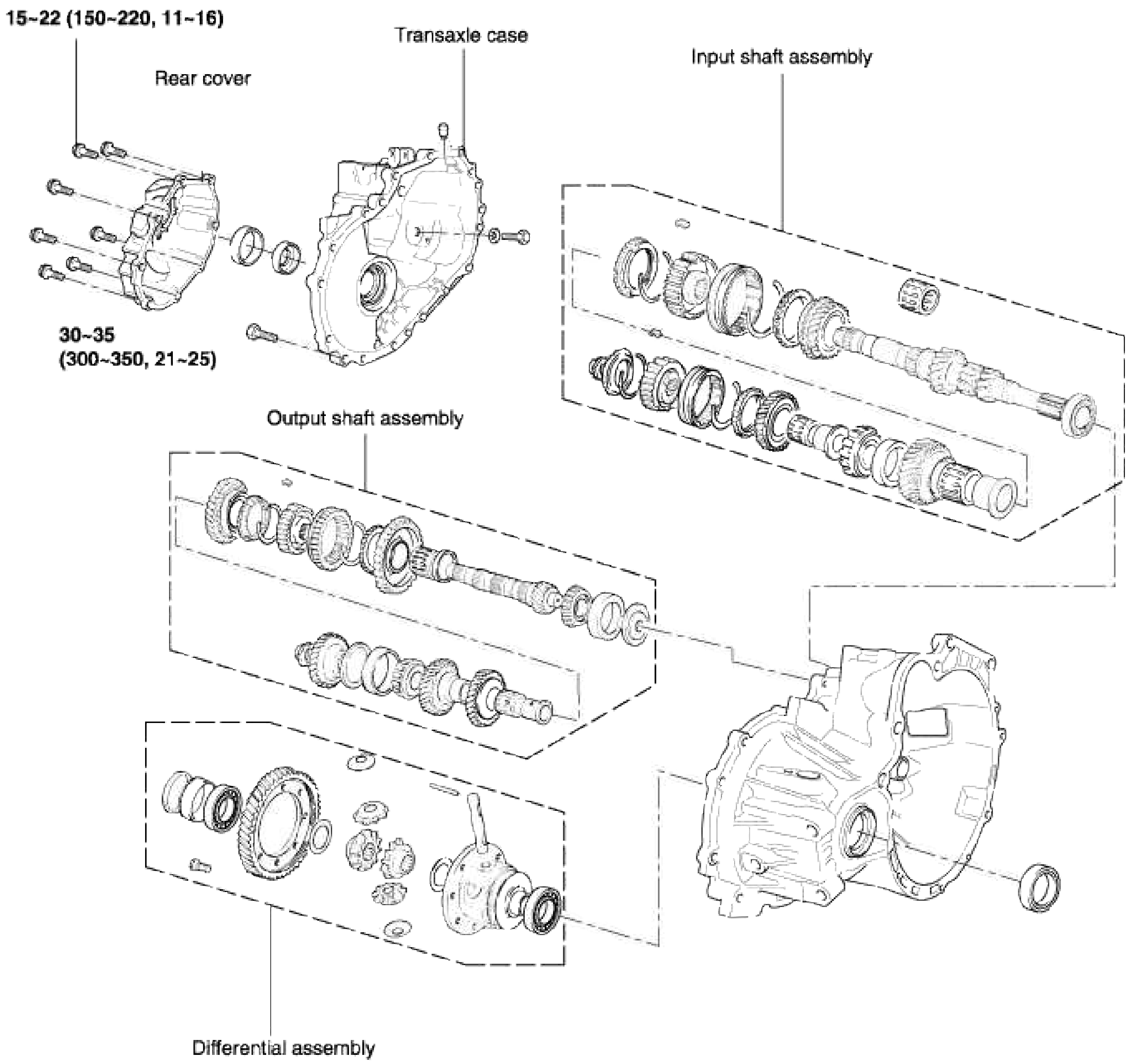

0.01T-0.09L
0.01T-0.12L
0.05T-0.10T
0.05L-0.17L
0.025L-0.150L

Manual Transaxle System > Manual Transaxle System > Manual Transaxle > Components and Components Location

COMPONENTS (1)


Bell housing cover
8-10 (80-100, 6-7)
Speedometer cable
Select cable
Shift cable
27-34 (270-340, 20-25)
Starter moter
TORQUE : Nm (kg-cm, lb-ft)

COMPONENTS (2)

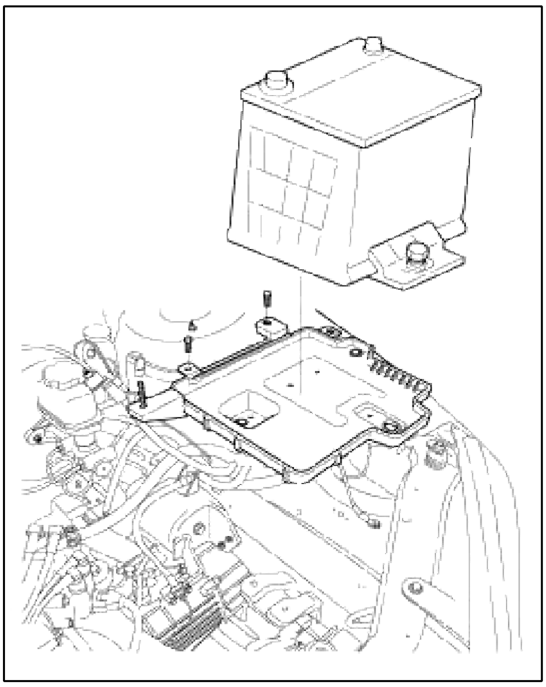

15~22 (150~220, 11~16)
Transaxle case
Input shaft assembly
Rear cover
30~35
(300~350, 21~25)
Output shaft assembly
Differential assembly

TORQUE : N·m (kg·cm, lb·ft)

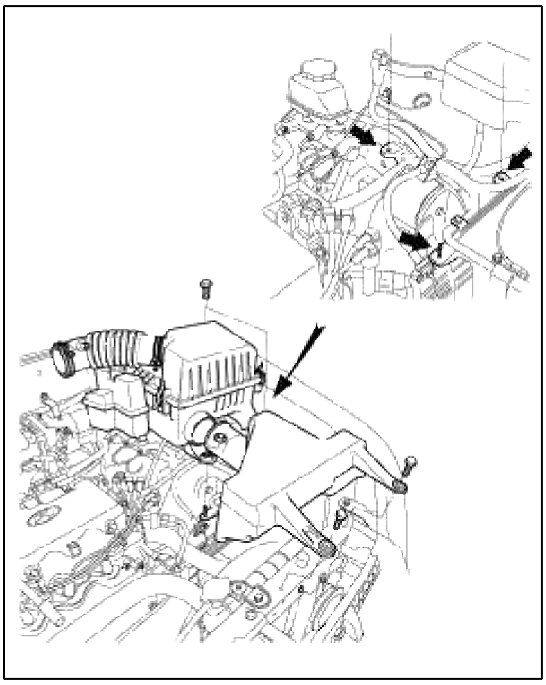
Manual Transaxle System > Manual Transaxle System > Manual Transaxle > Repair procedures

REMOVAL

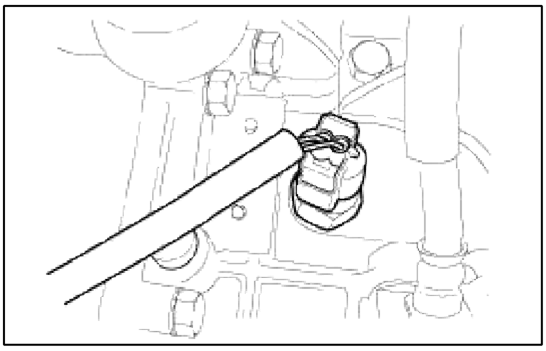
1. Remove the battery terminal and the battery.



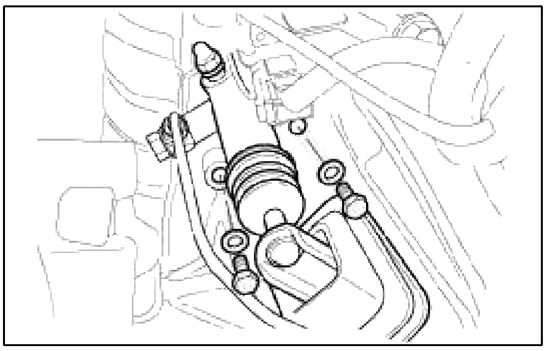
2. Removal the air cleaner.



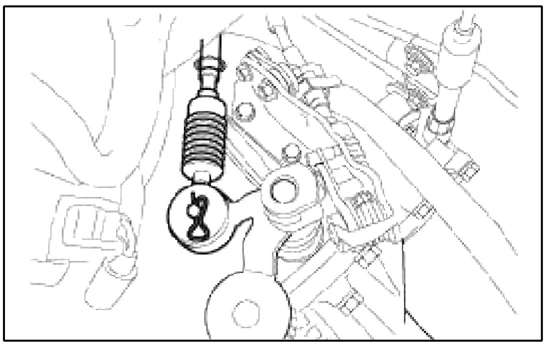
3. Remove the back-up lamp switch.



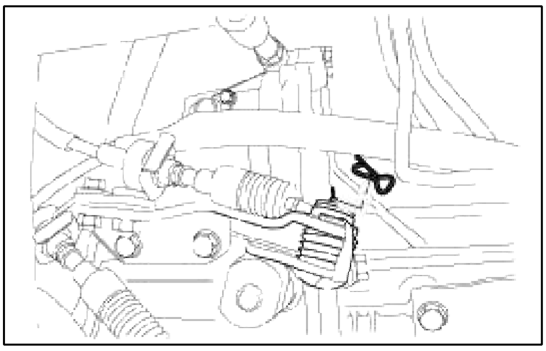
4. Remove the clutch release mounting bolts.



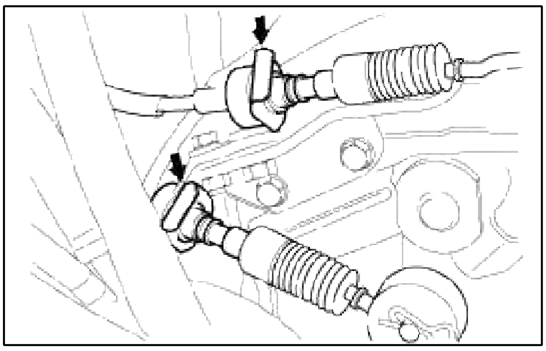
5. Remove the cotter pin of the shift cable.



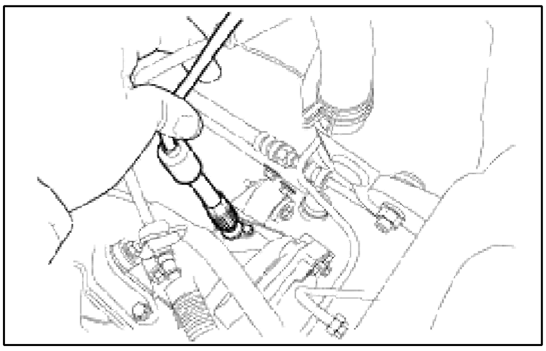
6. Remove the cotter pin of the selector cable.



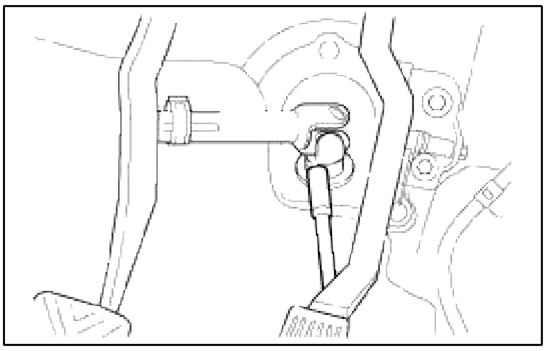
7. Remove the clip of the shift cable.
8. Remove the clip of the selector cable.



9. Remove the speedometer driven gear connector.

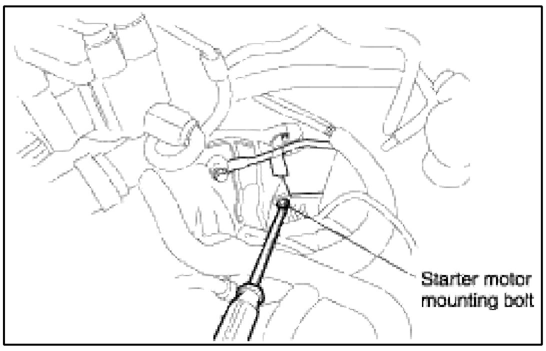


10. Remove the u-joint.

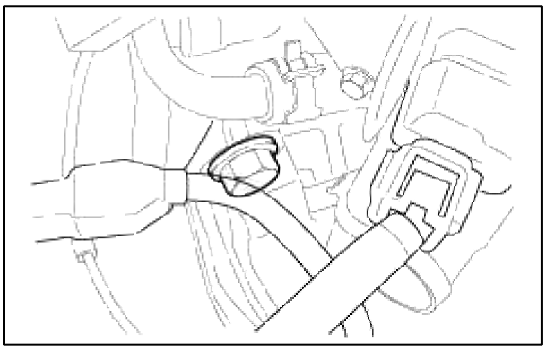


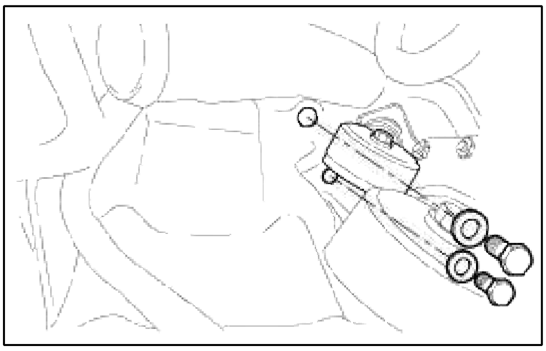
11. Remove the power steering return hose.
12. Remove the tire.

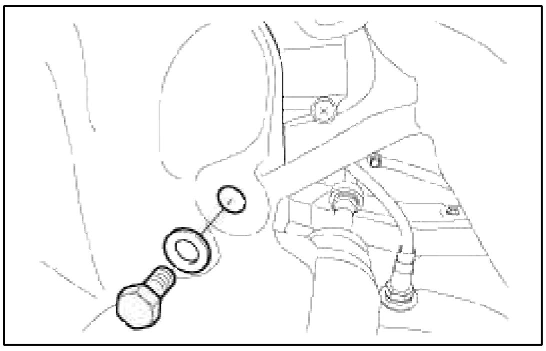
13. Remove the starter motor upward the transaxle.


Starter motor
mounting bolt

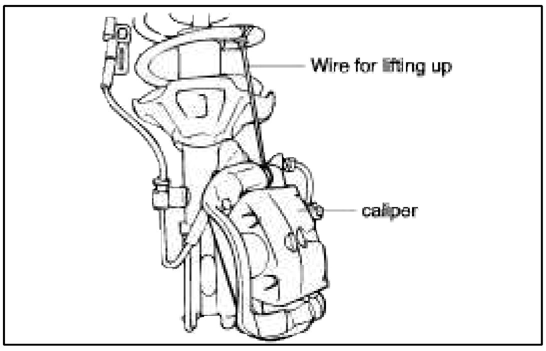
14. Remove the bolt for the upper connection of the engine and the transaxle.



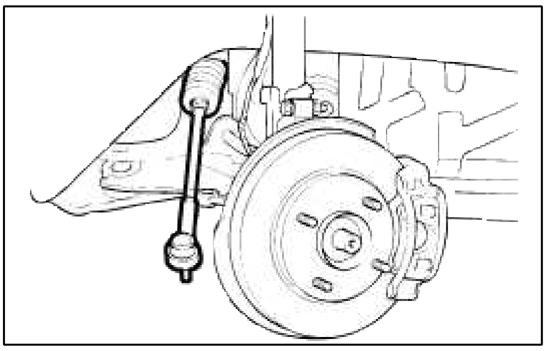




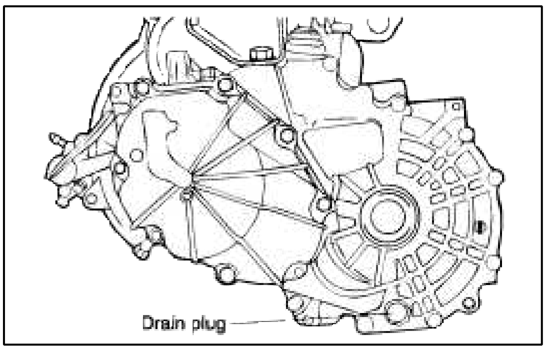
15. Remove the caliper after lifting up the vehicle.


Wire for lifting up
caliper

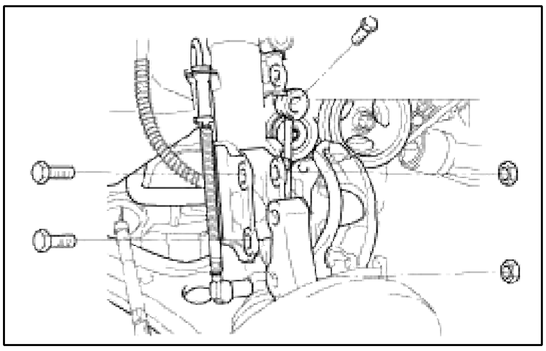
16. Separate the tie rod end from the pin and nut.



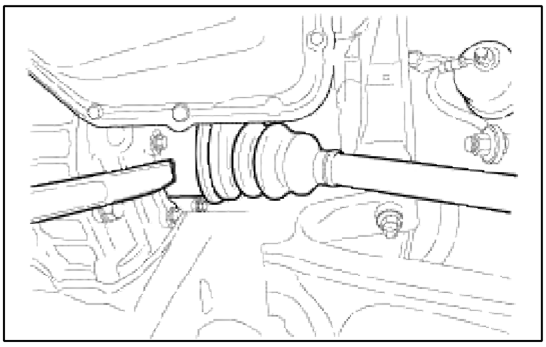
17. Remove the oil drain plug and drain the oil.



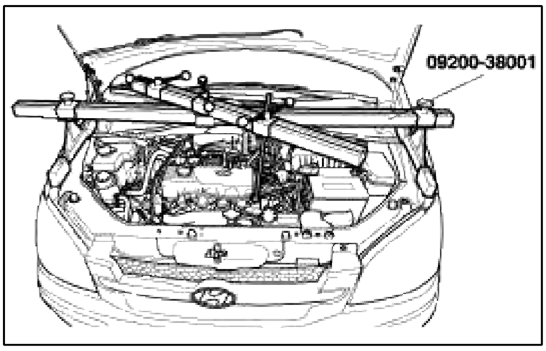
18. Remove the wheel speed sensor and the knuckle mounting bolt.



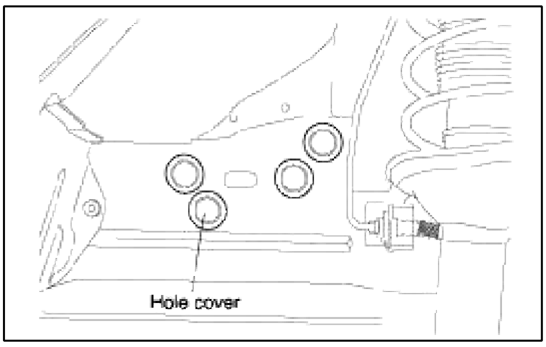
19. Remove the drive shaft and the hub nut.



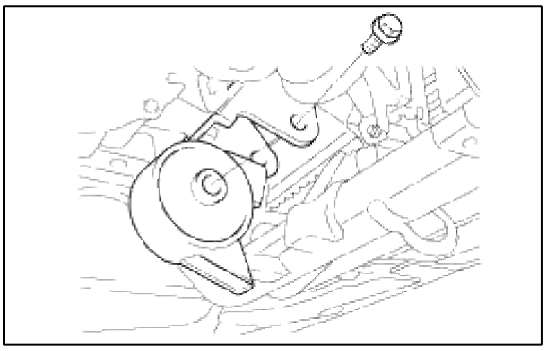
20. Install the special tool, the engine support fixture on the engine assembly.



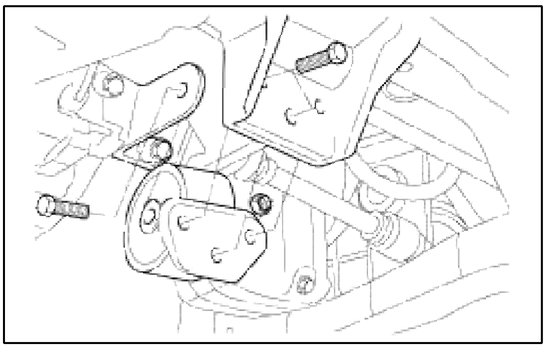
21. Remove the transaxle mounting bracket after removing the hole cover and the mounting bolts.



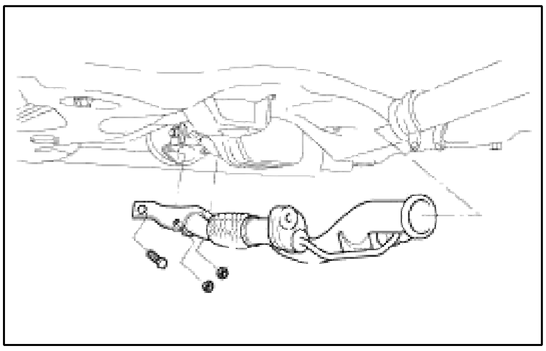
22. Remove the front roll stopper.



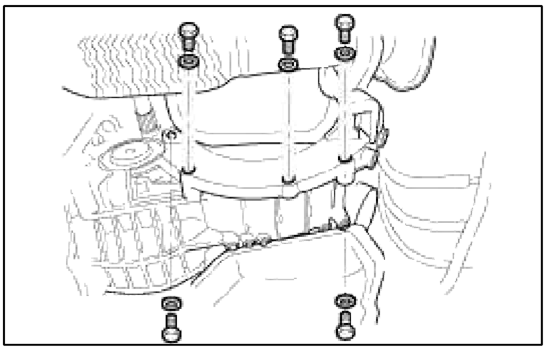
23. Remove the rear roll stopper.



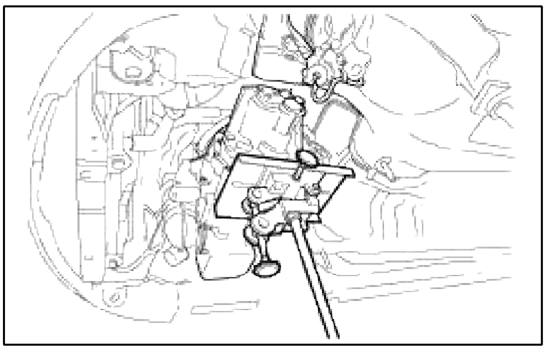
24. Remove the front muffler.



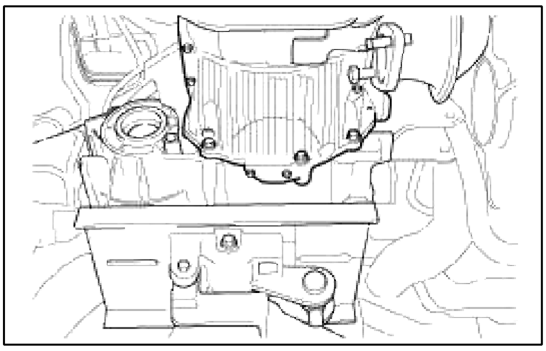
25. Remove the bell housing cover. (Bolt : 5EA)



26. Install the jack for supporting transaxle.



27. Remove the sub frame.
28. Remove the lower mounting bolts of the transaxle.



29. Remove the transaxle.

INSTALLATION

Installation is the reverse of removal.

INSPECTION

TRANSAXLE GEAR OIL LEVEL INSPECTION

Inspect the transaxle for evidence of leakage. Check the gear oil level by removing the filler plug. If the oil is contaminated, it is necessary to replace it with new oil.

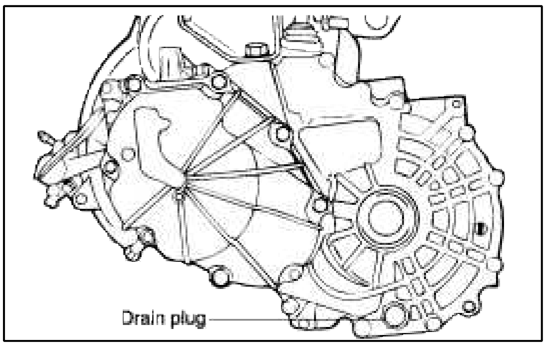
1. Remove the oil filler plug and check the level with finger.
2. Oil level must be up to the filler hole. If it is below the hole, add oil until it runs out, then reinstall the plug.
3. Replace the oil if the transaxle gear oil is noticeably dirty, or it is not of a suitable viscosity.

REPLACEMENT OF TRANSAXLE GEAR OIL

Use HP Gear Oil SAE 75W/90 (API-GL-4)

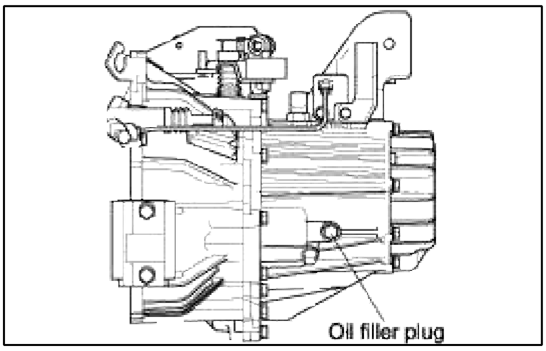
1. With the vehicle parked on a level surface, remove the drain plug and drain the transaxle oil.
2. Replace the gasket with a new one and install the drain plug.

Tightening torque:
Drain plug:30~35 Nm (300~350 kg·cm, 22~25 lb·ft)



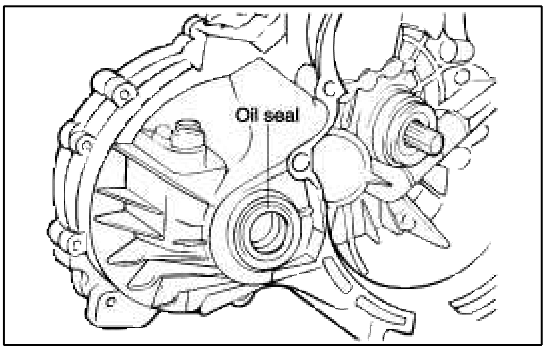
3. Add new oil the through the filler plug, filling to the same level as the opening plug.

Transaxle oil total capacity:
2.15 Liters (2.27 U.s.qts., 1.89 lmp.qts.)
Tightening torque :
Filler plug:30~35 Nm (300~350 kg·cm, 22~25 lb·ft)



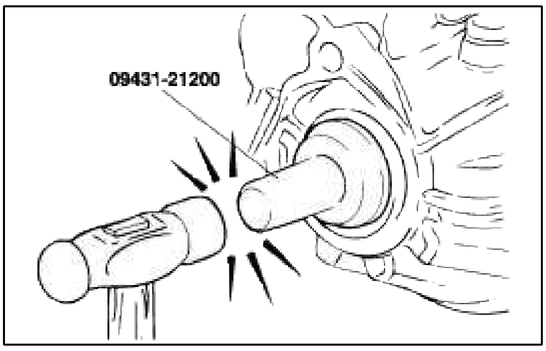
DRIVE SHAFT OIL SEAL REPLACEMENT

1. Disconnect the drive shaft from the transaxle (Refer to DS GROUP).
2. Using a flat-tip screwdriver, remove the oil seal.



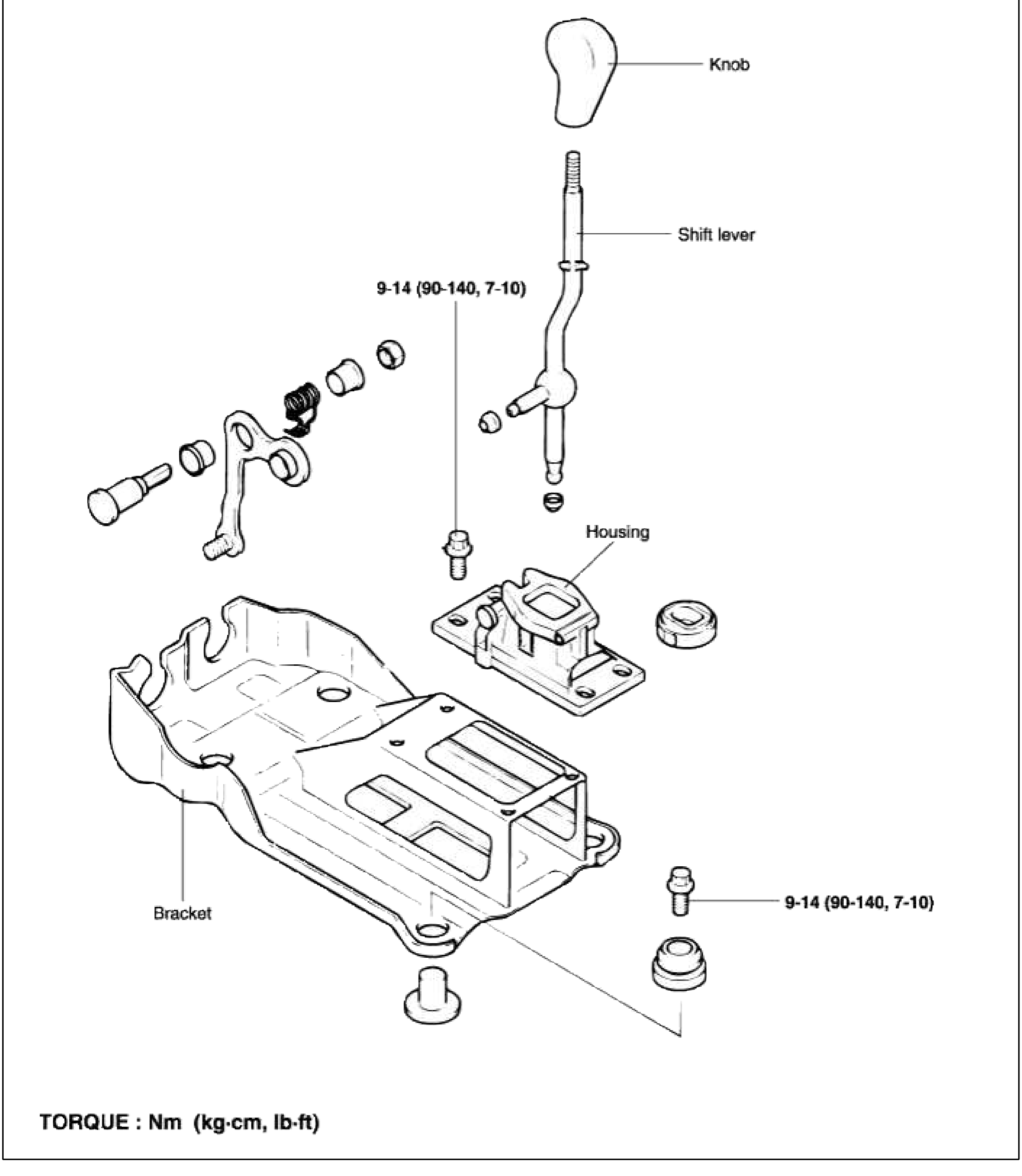
3. Using the special tool (09431-21200), tap the drive shaft oil seal into the transaxle.
4. Apply a coating of gear oil to the lip of the oil seal.

Transaxle gear oil:
HYUNDAI GENUINE PARTS MTF 75W/90
conforming to API GL-4 or higher



Manual Transaxle System > Manual Transaxle System > Shift Lever > Components and Components Location

COMPONENTS


Knob
Shift lever
9-14 (90-140, 7-10)
Housing
Bracket
9-14 (90-140, 7-10)
TORQUE : Nm (kg·cm, lb·ft)

Manual Transaxle System > Manual Transaxle System > Shift Lever > Repair procedures

INSPECTION

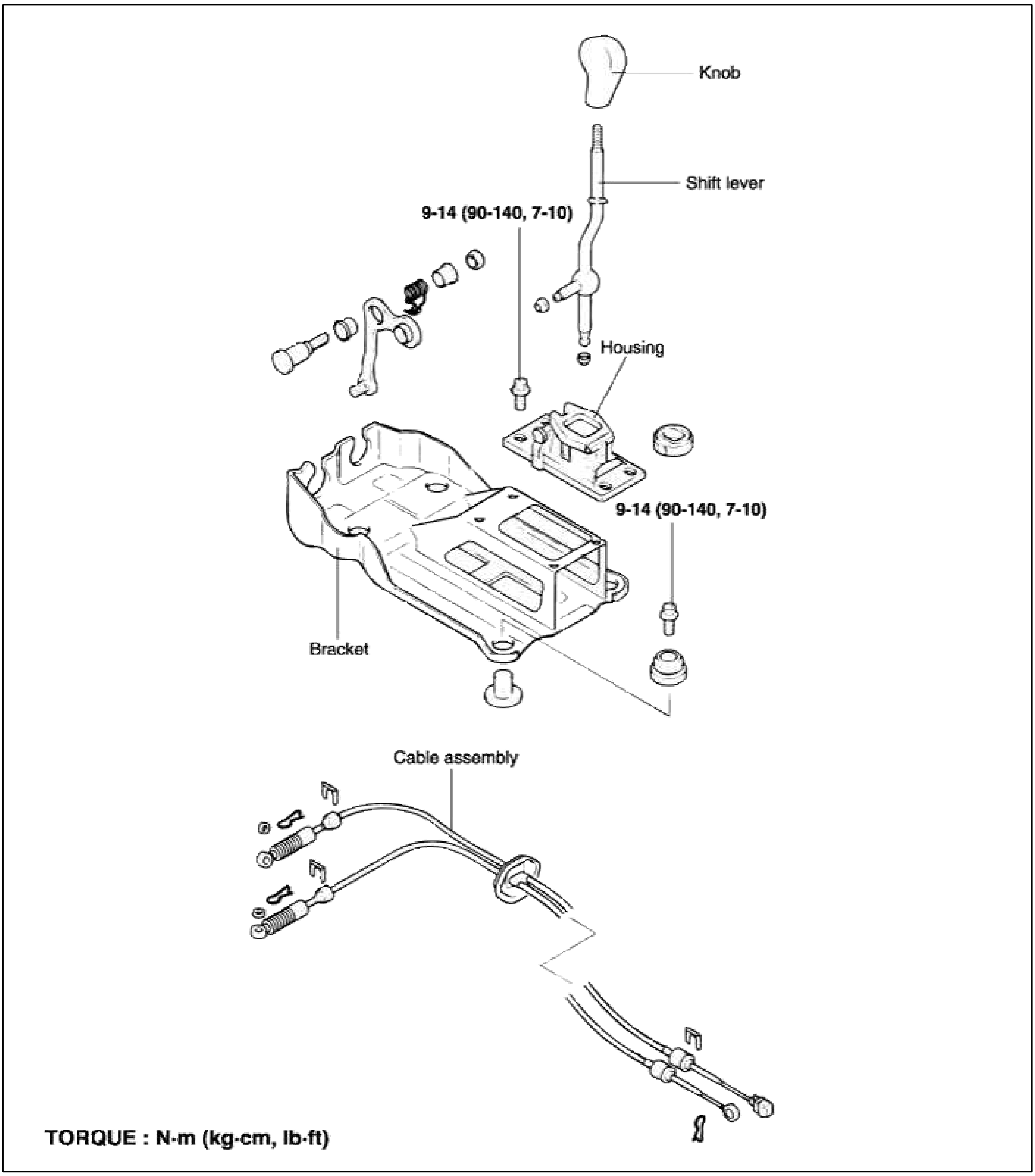
1. Check the bushing for wear or damage.
2. Check the return spring for damage or deterioration.

REASSEMBLY

1. Apply multi-purpose grease to the sliding part of the bushings.
2. Reassembly is the reverse of disassembly.

Manual Transaxle System > Manual Transaxle Control System > Manual Transaxle Shift Control > Components and Components Location

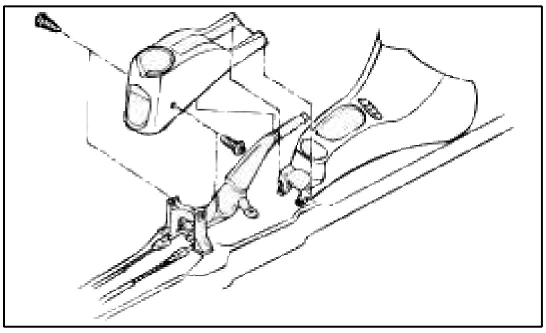
COMPONENTS


Knob
Shift lever
9-14 (90-140, 7-10)
Housing
9-14 (90-140, 7-10)
Bracket
Cable assembly
TORQUE : N·m (kg-cm, lb-ft)

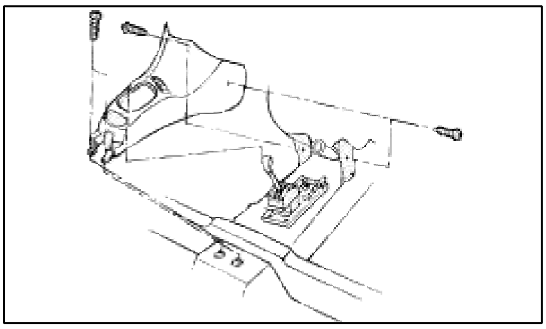
Manual Transaxle System > Manual Transaxle Control System > Manual Transaxle Shift Control > Repair procedures

REMOVAL

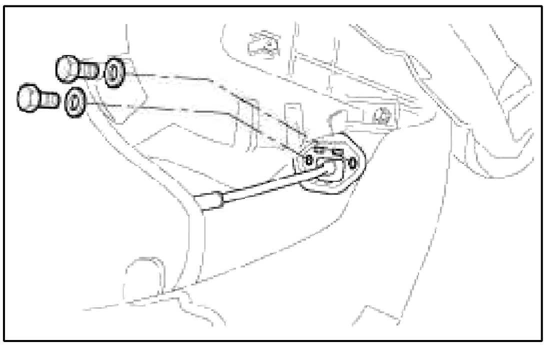
1. Remove the shift knob and the rear console.



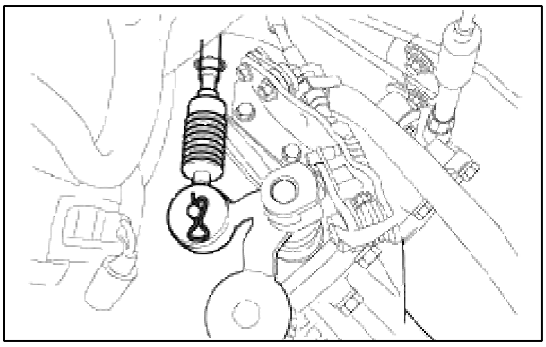
2. Remove the front console.



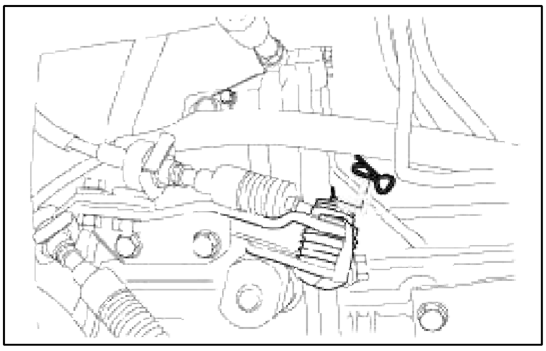
3. Remove the cable mounting bolts of the lower dash board.



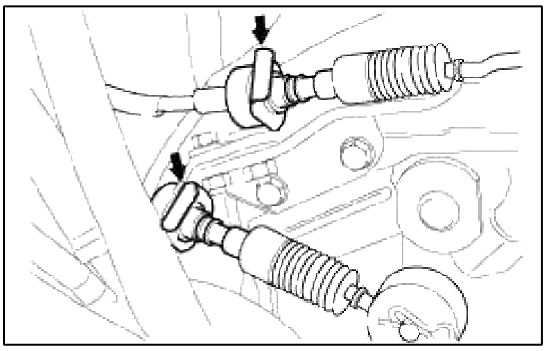
4. Remove the cotter pin of the shift cable.



5. Remove the cotter pin of the selector cable.



6. Remove the clip of the shift cable and the selector cable.



7. Remove the shift lever assembly.

INSTALLATION

Installation is the reverse of the removal.

INSPECTION

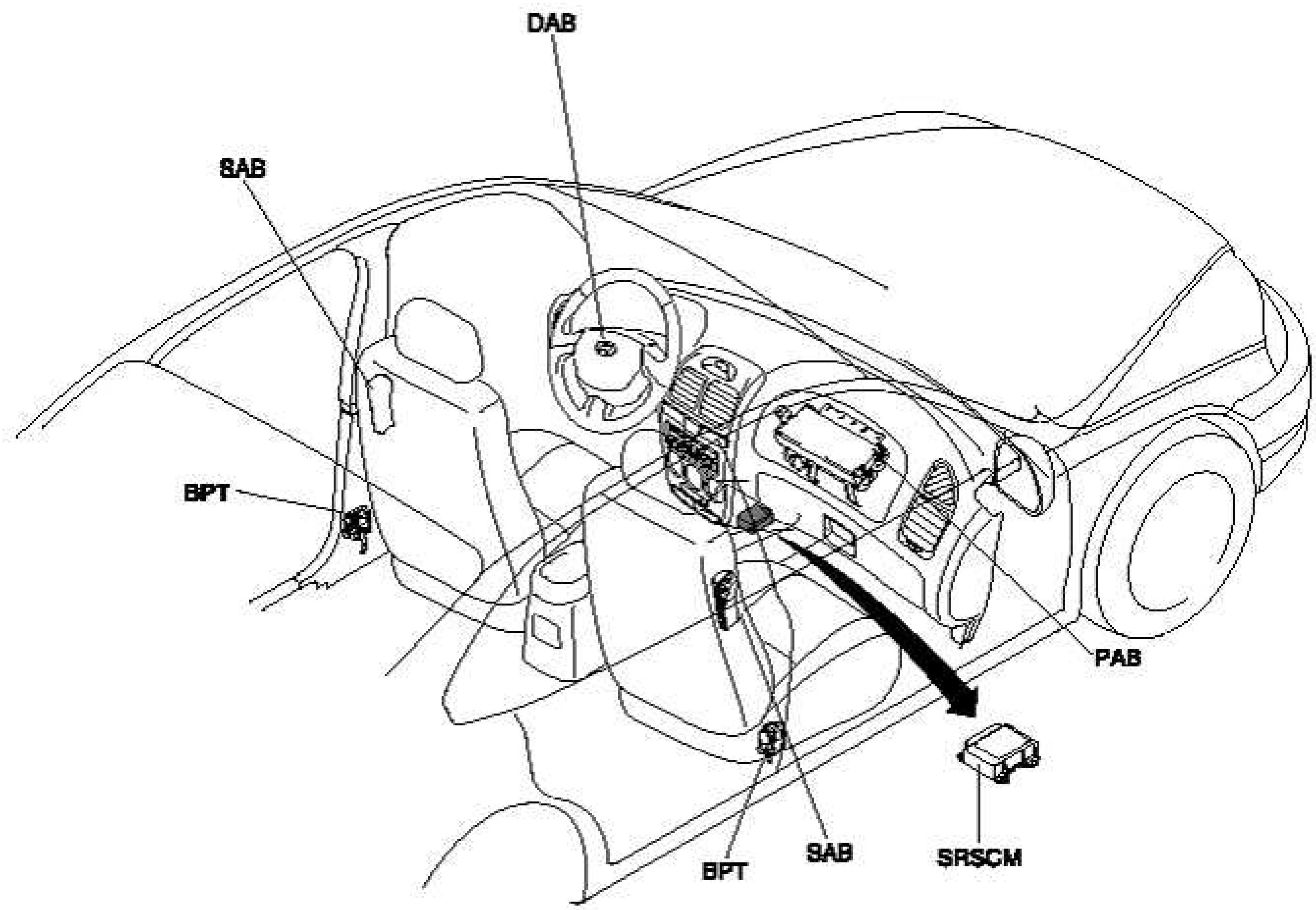
1. Check the select cable for proper operation and for damage.
2. Check the shift cable for proper operation and for damage.
3. Check the boot for damage.
4. Check each bushing for wear, abrasion, sticking, restricted movement or damage.
5. Check for a weak or damaged spring.

ACCENT(LC) > 2005 > G 1.5 SOHC > Restraint

Restraint > General Information > General Information

GENERAL

INFLATOR MODULE (DAB, PAB, SAB)


DAB
SAB
BPT
PAB
BPT
SAB
SRSCM

1. When removing the airbag module or handling a new airbag module, it should be placed with the pad top surface facing up. In this case, the twin-lock type connector lock lever should be in the locked state and care should be taken to place it so the connecter will not be damaged. Do not store a steering wheel pad on top of another one. (Storing the pad with its metallic surface up may lead to a serious accident if the airbag should inflate accidentally.)
2. Never measure the resistance of the airbag squib. (This may cause the airbag to deploy, which is very dangerous.)
3. Store the airbag module where the ambient temperature remains below 93°C (200°F), without high humidity and away from electrical noise.
4. During electric welding, disconnect the airbag under the steering column near the MULTI-FUNCTION SWITCH connector before starting work.

DUAL STAGE AIRBAGS (DAB, PAB)

In a light crash, the first stage of the duel stage airbag is deployed, and the second stage is deployed in 127ms after deployment of the first stage by SRSCM.

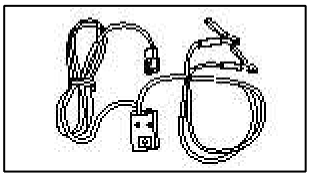
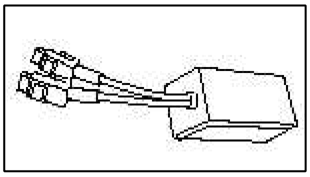
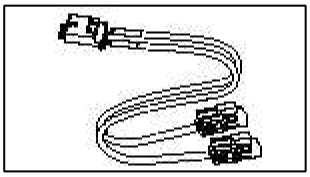
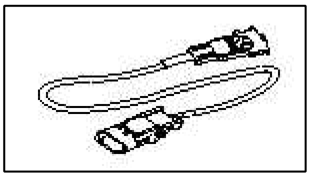
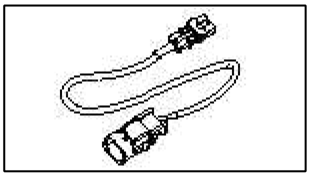
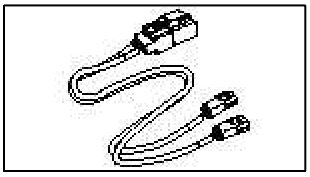
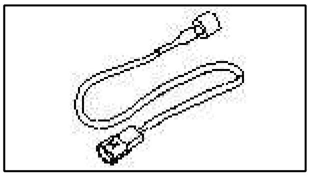
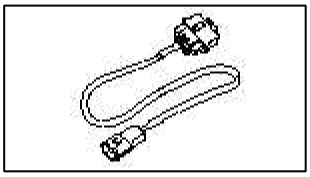
When scrapping a car of intentionally deploying the replaced airbag modules, deploy individual stage.

CUSTOMER CAUTIONS

1. Be sure to proceed with airbag related service only after approx. 30 seconds or longer from the time the ignition switch is turned to the LOCK position and the negative (-) battery cable is disconnected from the battery. The airbag system is equipped with a back-up power source to assure the deployment of airbags when the battery cable is disconneted during an accident. The back-up power is available for approx. 150ms.
2. When the negative (-) battery cable is disconnected from the battery, the clock and audio system's memory will be wiped out. So before starting work, make a record of the contents of the audio system's memory. When the work is finished, reset the audio system and adjust the clock.
3. Symptoms of malfunction of the airbag system are difficult to detect, so the diagnostic codes become the most important source of information when troubleshooting.
4. When troubleshooting the airbag system, always inspect the diagnostic codes before disconnecting the battery.
5. Never use airbag parts from another vehicle. When replacing parts, replace them with new parts.
6. Never attempt to disassemble and repair the airbag modules (DAB, PAB, SAB, BPT), clock spring and wiring in order to reuse them.
7. If any component of the SRS has been dropped, or if there are cracks, dents or other defects in the case, bracket or connector, replace them with new ones.
8. After work on the airbag system is completed, perform an SRS SRI check. The airbag indicator lamp can be triggered by faults in other circuit in some cases. Therefore if the airbag indicator lamp goes on, be sure to erase the DTC codes using the Hi-Scan Pro just after repairing or replacing the troubled parts, including the fuse.
9. Especially when performing body welding, never fail to disconnect the battery's negative (-) terminal.

Restraint > General Information > Special Service Tools

SPECIAL TOOLS

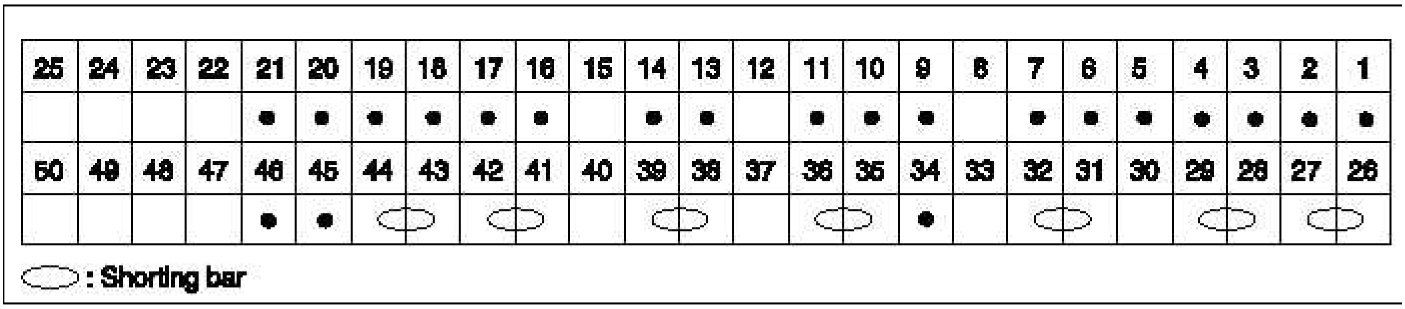
Tool (Number and name)	Illustration	Use
0957A-34100A Deployment tool		Airbag deployment tool PAB : 0957A-25000 (Dual stage) DAB, BPT : 0957A-38500 PAB, SAB : 0957A-38100
0957A-38200 Dummy		Simulator to check the resistance of each wiring harness Dummy adapter PAB : 0957A-25100 (Dual stage) DAB, BPT : 0957A-1C000 PAB, SAB : 0957A-38300
0957A-25000 Deployment adapter		Use with deployment tool.
0957A-38500 Deployment adapter		Use with deployment tool.
0957A-38100 Deployment adapter		Use with deployment tool.
0957A-25100 Dummy adapter		Use with dummy.
0957A-1C000 Dummy adapter		Use with dummy
0957A-38300 Dummy adapter		Use with dummy

* DAB: Driver Airbag
* PAB: Passenger Airbag
* SAB: Side Airbag
* BPT: Belt Pretensioner

Restraint > Supplemental Restraint System Control Module (SRnodeM) > Schematic Diagrams

SRSCM CONNECTOR

DAB+PAB+SAB+BPT (SRE-LC)

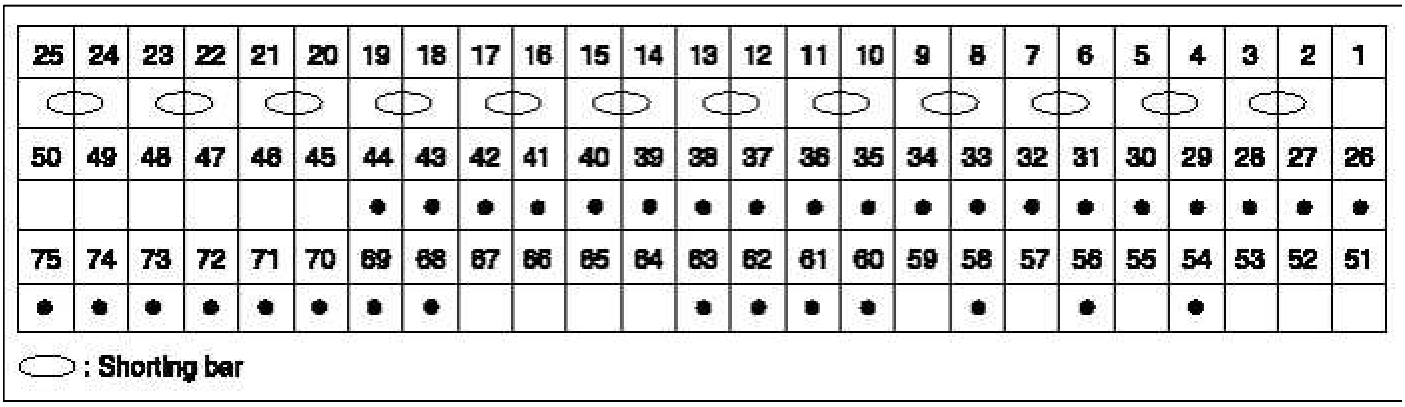

25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
: Shorting bar

CONNECTOR

PIN NO.	FUNCTION	INPUT/OUTPUT
1	Passenger side airbag, High	Output
2	Passenger side airbag, Low	Output
3	Driver side airbag, Low	Output
4	Driver side airbag, High	Output
5	Battery supply	Input
6	GND	Input
7	Warning lamp	Output
8	-	-
9	K-diagnostic line	Input/output
10	Driver airbag, High	Output
11	Driver airbag, Low	Output
12	-	-
13	Passenger airbag, High	Output
14	Passenger airbag, Low	Output
15	-	-
16	Passenger belt pretensioner, Low	Output
17	Passenger belt pretensioner, High	Output
18	Driver belt pretensioner, High	Output
19	Driver belt pretensioner, Low	Output
20	Driver satellite sensor, High	Output
21	Driver satellite sensor, Low	Output
22	-	-
23	-	-
24	-	-
25	-	-
26 ~ 27	Shorting bar	-
28 ~ 29	Shorting bar	-

30	-	-
31 ~ 32	Shorting bar	-
33	-	-
34	Crash output	Output
35 ~ 36	Shorting bar	-
37	-	-
38 ~ 39	Shorting bar	-
40	-	-
41 ~ 42	Shorting bar	-
43 ~ 44	Shorting bar	-
45	Driver satellite sensor, Low	Output
46	Passenger satellite sensor, Low	Output
47	-	-
48	-	-
49	-	-
50	-	-

DAB+PAB+SAB+BPT (DUAL-STAGE AIRBAG)


25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26
75 74 73 72 71 70 69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51
: Shorting bar

PIN NO.	FUNCTION	INPUT/OUTPUT
1	-	-
2 ~ 25	Shorting bar	-
26	Battery supply	Input
27	Warning lamp	Output
28	Ground	Input
29	Driver airbag 1st stage, Low	Output
30	Driver airbag 1st stage, High	Output
31	Passenger airbag 1st stage, High	Output
32	Passenger airbag 1st stage, Low	Output
33	Driver belt pretensioner, Low	Output

34	Driver belt pretensioner, High	Output
35	Passenger belt pretensioner, High	Output
36	Passenger belt pretensioner, Low	Output
37	Driver side airbag, Low	Output
38	Driver side airbag, High	Output
39	Passenger side airbag, High	Output
40	Passenger side airbag, Low	Output
41	Driver side airbag 2nd stage, Low	Output
42	Driver side airbag 2nd, High	Output
43	Passenger airbag 2nd statge, High	Output
44	Passenger airbag 2nd stage, Low	Output
45	-	-
46	-	-
47	-	-
48	-	-
49	-	-
50	-	-
51 ~ 53	-	-
54	K-diagnostic line	Input/output
55	-	-
56	Crash output	Output
57	-	-
58	Enhanced crash output	Output
59	-	-
60	Driver seat track position sensor	Input
61	Driver seat buckle switch0	Input
62	Passenger seat buckle switch	Intput
63	Passenger seat track position sensor	Intput
64 ~ 67	-	-
68	Passenger side impact sensor, Low	Intput/output
69	Passenger side impact sensor, High	Input/output

70	Driver side impact sensor, High	Input/output
71	Driver side impact sensor, Low	Input/output
72	Passenger front impact sensor, Low	Input/output
73	Passenger front impact sensor, High	Input/output
74	Driver front impact sensor, High	Input/output
75	Driver front impact sensor, Low	Input/output

Restraint > Supplemental Restraint System Control Module (SRnodeM) > Description and Operation

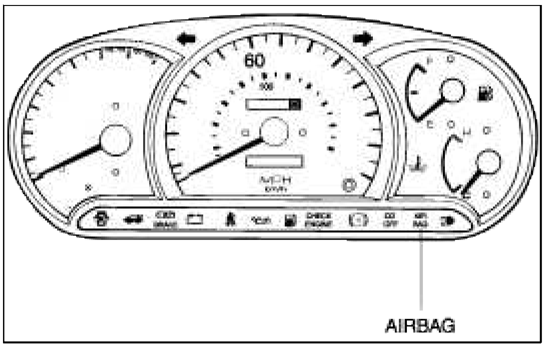
SRSCM

SRSCM (Supplement Restraint System Control Module)

1. DC/DC convertor : The DC/DC converter in the power supply includes a step-up and a step-down converter, which provides the firing voltage for four firing circuits and the internal operating voltage. If the internal operating voltage falls below a defined threshold, a reset is executed.
2. Arming sensor/safing sensor : The arming/safing sensor built in to the airbag firing circuit has the function of arming the airbag circuit under all required deployment conditions and maintaining the airbag firing circuits unarmed under normal driving conditions. The safing sensor is a dual-contact electromechanical switch that closes if it experiences a deceleration exceeding a specified threshold.
3. Back-up power : The SRSCM reserves an energy reserve to provide deployment energy for a short period when the vehicle voltage is low or if lost in a vehicle frontal crash.
4. Malfunction detection : The SRSCM continuously monitors SRS operating status while the ignition key is turned on and detects possible malfunctions in the system. The malfunction can be displayed in the form of a diagnostic trouble codes using the Hi-Scan Pro.
5. MIL (Malfunction Indication Lamp) notification : If any fault is detected, the SRSCM sends a signal to the indicator lamp on the instrument cluster to warn the vehicle driver.
   The MIL indicator is the key item in notifying the driver of SRS faults. It verifies lamp and SRSCM operation by flashing 6 times when the ignition switch is first turned on.
6. Malfunction recording : Once a fault occurs in the system, the SRSCM records the fault in memory in the form of a DTC, which can only be erased by the Hi-Scan Pro.
7. Data link connector : SRSCM memory stored is linked through this connector located underneath the driver side crash pad to an external output device such as the Hi-Scan Pro.
8. What if only BPT's deploy.
9. Crash output
   The crash output is used to unlock the doors in case of a crash. The crash output is : 0-200 µA in OFF mode and 200mA in ON mode. During the unlock command, the switch is closed for 200 mS.

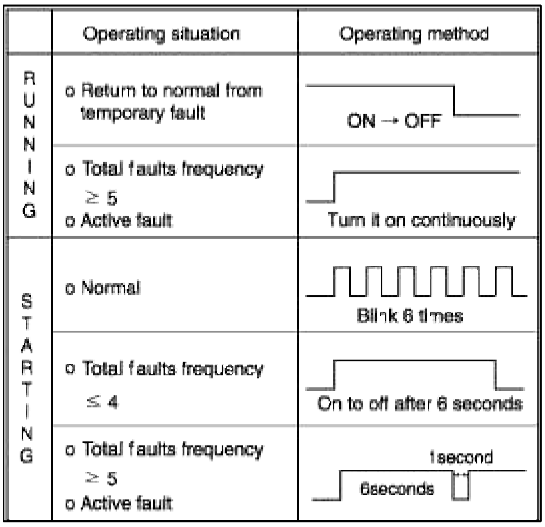
SRS HARNESS

SRSCM INDEPENDENT LAMP ACTIVATION



1. Loss of ignition voltage supply to the SRSCM : lamp turned on continuously.
2. Loss of internal operating voltage: lamp turned on continuously.
3. SRSCM not connected: lamp turned on through shorting bar in wiring harness connector.

MIL OPERATING METHOD

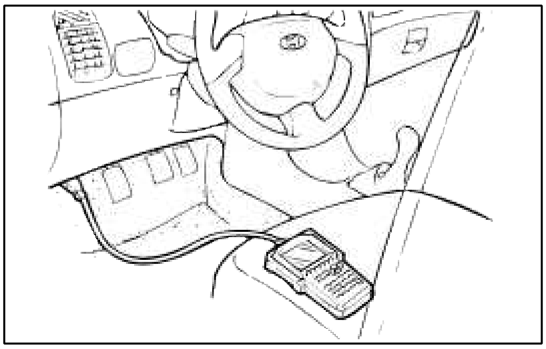


	Operating situation	Operating method
RUNNING	o Return to normal from temporary fault	ON → OFF
	o Total faults frequency ≥ 5 o Active fault	Turn it on continuously
STARTING	o Normal	Blink 6 times
	o Total faults frequency ≤ 4	On to off after 6 seconds
	o Total faults frequency ≥ 5 o Active fault	6seconds 1second

DIAGNOSIS WITH SCAN TOOL

CHECK PROCEDURES

1. Connect the Hi-Scan Pro DLC to the vehicle's data link connector located underneath the dash panel.
2. Turn the ignition key to the "ON" position and turn the Hi-Scan Pro ON.
3. Perform the SRS diagnosis according to the vehicle model configuration.
4. If a fault code is assured, then replace the component. Never attempt to repair the component.
5. If the Hi-Scan Pro finds that a component of the system is faulty, there is a possibility that the fault is not in the component, but in SRS wiring or connector.

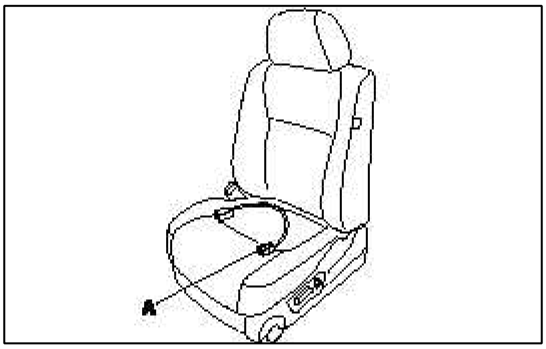


SEAT TRACK POSITION SENSOR REPLACEMENT

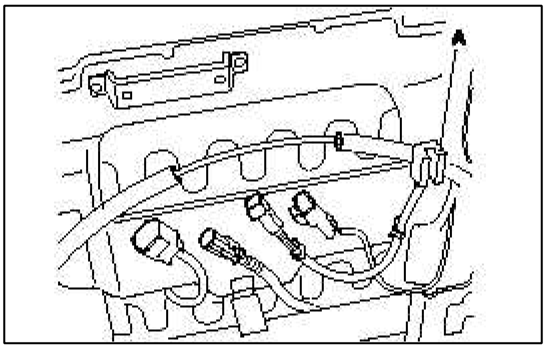
REMOVAL

1. Disconnect the battery negative cable and wait at least three minutes before beginning work.
2. Remove the seat assembly.

3. Disconnect the seat track position sensor 2P connector (A).



4. Remove the seat track position sensor (A).



INSTALLATION

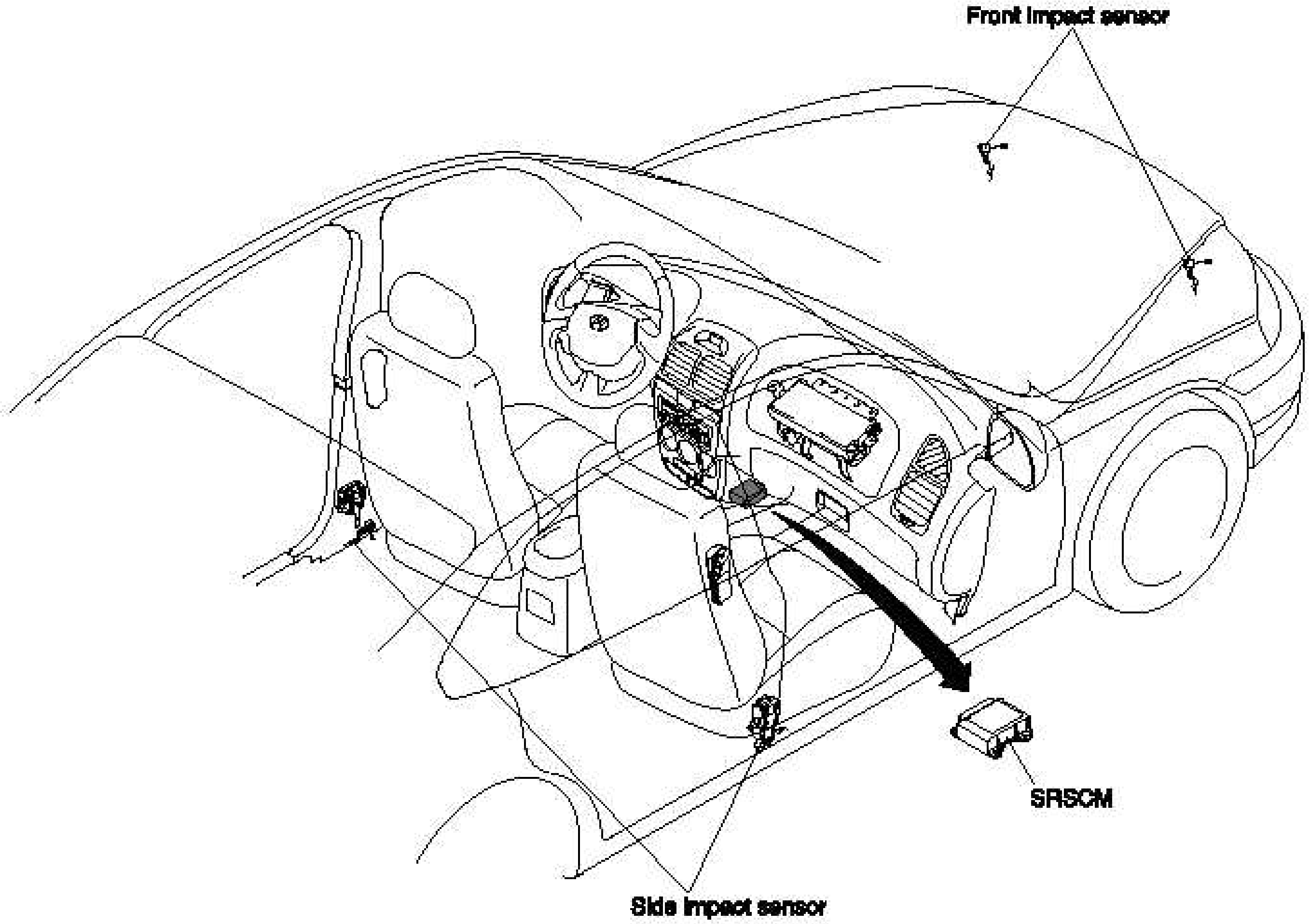
CAUTION

Be sure to install the harness wires so that they are not pinched or interfering other parts.

1. Install the new seat track position sensor.
2. Connect the seat track position sensor 2P connector.
3. Install the seat assembly.
4. Reconnect the battery negative cable.
5. After installing the seat track position sensor, confirm proper system operation: Turn the ignition switch ON: the SRS indicator light should blink for about six seconds and then go off.
6. Relining and side the front seat forward fully, make sure the harness wires are not wires not pinched or interfering with other parts.

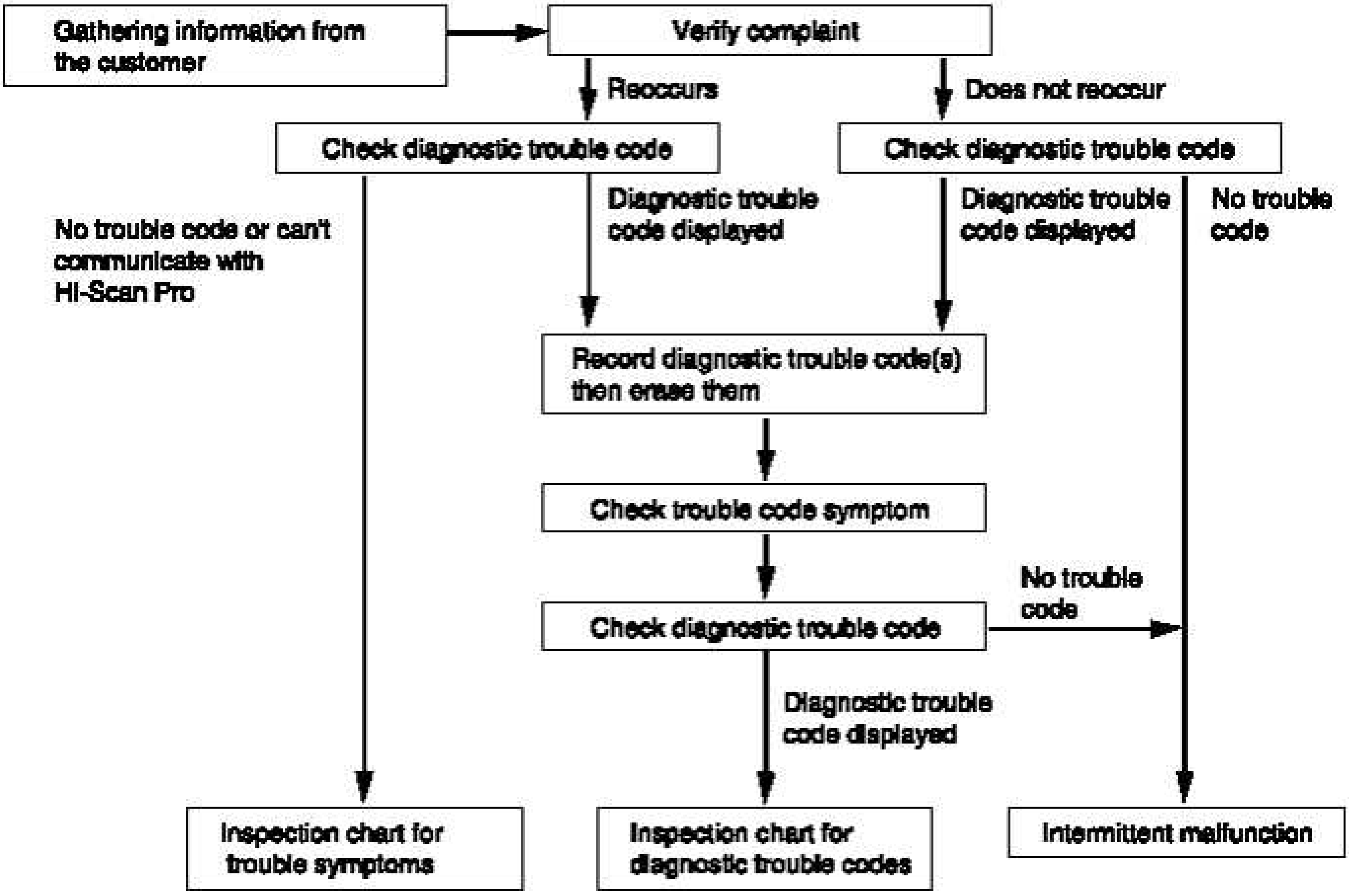
Restraint > Supplemental Restraint System Control Module (SRnodeM) > Components and Components Location

SYSTEM COMPONENT AND LAYOUT


Front impact sensor
SRSCM
Side impact sensor

Restraint > Supplemental Restraint System Control Module (SRnodeM) > Troubleshooting

DIAGNOSTIC TROUBLESHOOTING FLOW


Gathering information from the customer
Verify complaint
Reoccurs
Does not reoccur
Check diagnostic trouble code
Check diagnostic trouble code
No trouble code or can't communicate with Hi-Scan Pro
Diagnostic trouble code displayed
Diagnostic trouble code displayed
No trouble code
Record diagnostic trouble code(s) then erase them
Check trouble code symptom
No trouble code
Check diagnostic trouble code
Diagnostic trouble code displayed
Inspection chart for trouble symptoms
Inspection chart for diagnostic trouble codes
Intermittent malfunction

AIRBAG SQUIB RESISTANCE LIMITS

DAB

R ≤ 1.06Ω	Resistance too low	Fault definitely detected
1.8Ω ≤ 3.4Ω	Resistance within tolerance	Definitely no fault detected
R ≥ 6.7Ω	Resistance too high	Fault definitely detected
1.06Ω < R <1.6Ω 2.8Ω < R < 6.7Ω	Tolerance band	Fault may or may not be detected

PAB, SAB, BPT

R ≤ 0.4Ω	Resistance too low	Fault definitely detected
1.6Ω ≤ 2.8Ω	Resistance within tolerance	Definitely no fault detected
R ≥ 5.4Ω	Resistance too high	Fault definitely detected
0.4Ω < R <1.6Ω 2.8Ω < R < 5.4Ω	Tolerance band	Fault may or may not be detected

SRE-SMART : DUAL STAGE AIRBAG

DAB, DAB (2ND STAGE)

$R \leq 0.9\Omega$	Resistance too low	Fault definitely detected
$1.6\Omega \leq R \leq 4.1\Omega$	Resistance within tolerance	Definitely no fault detected
$R \geq 6.0\Omega$	Resistance too high	Fault definitely detected
$1.9\Omega < R < 1.6\Omega$ $4.1\Omega < R < 6.0\Omega$	Tolerance band	Fault may or may not be detected

PAB, SAB, PAB (2ND STAGE)

$R \leq 1.0\Omega$	Resistance too low	Fault definitely detected
$1.8\Omega \leq R \leq 2.8\Omega$	Resistance within tolerance	Definitely no fault detected
$R \geq 4.2\Omega$	Resistance too high	Fault definitely detected
$1.0\Omega < R < 1.8\Omega$ $2.8\Omega < R < 4.2\Omega$	Tolerance band	Fault may or may not be detected

BPT

$R \leq 0.9\Omega$	Resistance too low	Fault definitely detected
$1.8\Omega \leq R \leq 3.1\Omega$	Resistance within tolerance	Definitely no fault detected
$R \geq 4.7\Omega$	Resistance too high	Fault definitely detected
$0.9\Omega < R < 1.8\Omega$ $3.1\Omega < R < 4.7\Omega$	Tolerance band	Fault may or may not be detected

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE

OPTIONS : DAB + PAB + SAB + BPT (SRE-LC)

DTC No.	Fault description
B1111	Battery voltage too high
B1112	Battery voltage too low
B1346	Driver airbag (DAB), Resistance too high
B1347	Driver airbag (DAB), Resistance too low
B1348	Driver airbag (DAB), Short to ground
B1349	Driver airbag (DAB), Short to Battery
B1352	Passenger airbag (PAB), Resistance too high
B1353	Passenger airbag (PAB), Resistance too low
B1354	Passenger airbag (PAB), Short to ground
B1355	Passenger airbag (PAB), Short to Battery
B1361	Driver seat belt pretensioner (DBPT), Resistance too high
B1362	Driver seat belt pretensioner (DBPT), Resistance too low
B1363	Driver seat belt pretensioner (DBPT), Short to ground
B1364	Driver seat belt pretensioner (DBPT), Short Battery

B1367	Passenger seat belt pretensioner (PBPT), Resistance too high
B1368	Passenger seat belt pretensioner (PBPT), Resistance too low
B1369	Passenger seat belt pretensioner (PBPT), Short to ground
B1370	Passenger seat belt pretensioner (PBPT), Short to Battery
B1378	Driver side airbag (DSAB), Resistance too High
B1379	Driver side airbag (DSAB), Resistance too Low
B1380	Driver side airbag (DSAB), Short to ground
B1381	Driver side airbag (DSAB), Short to Battery
B1382	Passenger side airbag (PSAB), Resistance too high
B1383	Passenger side airbag (PSAB), Resistance too low
B1384	Passenger side airbag (PSAB), Short to ground
B1385	Passenger side airbag (PSAB), Short to Battery
B1400	Satellite driver side sensor defect
B1401	Satellite driver side short to ground
B1402	Satellite driver side short to battery
B1403	Satellite passenger side sensor defect
B1404	Satellite passenger side short to ground
B1405	Satellite passenger side short to battery
B1620	Internal failure
B1650	Crash recorded (Frontal repace SRE-HMC)
B1661	Parameter configuration missing/incorrect
B2500	Warning lamp failure

OPTIONS : DAB+PAB+SAB+BPT (DUAL STAGE AIRBAG)

DTC No.	Fault description
B1101	Battery voltage too high
B1102	Battery voltage too low
B1103	Communication voltage too low
B1326	Driver side front impact sensor short to ground
B1327	Driver side front impact sensor short to battery
B1328	Driver side front impact sesnor defect
B1329	Driver side front impact sesnor communication error
B1330	Driver side front impact sesnor wrong ID
B1331	Passenger side front impact sesnor short to ground

B1332	Passenger side front impact sesnor short to battery
B1333	Passenger side front impact sesnor defect
B1334	Passenger side front impact sesnor communication error
B1335	Passenger side front impact sesnor wrong ID
B1346	1st stage driver airbag (DAB), Resistance too high
B1347	1st stage driver airbag (DAB), Resistance too low
B1348	1st stage driver airbag (DAB), Short to ground
B1349	1st stage driver airbag (DAB), Short to Battery
B1352	1st stage passenger airbag (PAB), Resistance too high
B1353	1st stage passenger airbag (PAB), Resistance too low
B1354	1st stage passenger airbag (PAB), Short to ground
B1355	1st stage passenger airbag (PAB), Short to Battery
B1361	Driver seat belt pretensioner (DBPT), Resistance too high
B1362	Driver seat belt pretensioner (DBPT), Resistance too low
B1363	Driver seat belt pretensioner (DBPT), Short to ground
B1364	Driver seat belt pretensioner (DBPT), Short Battery
B1367	Passenger seat belt pretensioner (PBPT), Resistance too high
B1368	Passenger seat belt pretensioner (PBPT), Resistance too low
B1369	Passenger seat belt pretensioner (PBPT), Short to ground
B1370	Passenger seat belt pretensioner (PBPT), Short to Battery
B1378	Driver side airbag (DSAB), Resistance too High
B1379	Driver side airbag (DSAB), Resistance too Low
B1380	Driver side airbag (DSAB), Short to ground
B1381	Driver side airbag (DSAB), Short to Battery
B1382	Passenger side airbag (PSAB), Resistance too high
B1383	Passenger side airbag (PSAB), Resistance too low
B1384	Passenger side airbag (PSAB), Short to ground
B1385	Passenger side airbag (PSAB), Short to Battery
B1387	Driver seat-track position sensor short to ground
B1388	Driver seat-track position sensor short to battery
B1389	Driver seat-track position sensor defect
B1390	Passenger seat-track position sensor short to ground
B1391	Passenger seat-track position sensor short to battery
B1392	Passenger seat-track position sensor defect
B1395	Firing loop interconnection fault
B1400	Side impact sensor driver side defect

B1401	Side impact sensor driver side short to ground
B1402	Side impact sensor driver side short to battery
B1403	Side impact sensor passenger side sensor defect
B1404	Side impact sensor passenger side short to ground
B1405	Side impact sensor passenger side short to battery
B1409	Side impact sensor driver side communication error
B1410	Side impact sensor passenger side communication error
B1414	Side impact sensor driver side wrong ID
B1415	Side impact sensor passenger side wrong ID
B1481	2nd stage driver airbag, Resistance too high
B1482	2nd stage driver airbag, Resistance too low
B1483	2nd stage driver airbag, Short to ground
B1484	2nd stage driver airbag, Short to battery
B1485	2nd stage passenger airbag, Resistance too high
B1486	2nd stage passenger airbag, Resistance too low
B1487	2nd stage passenger airbag, Short to ground
B1488	2nd stage passenger airbag, Short to battery
B1511	Driver seat buckle switch short to battery
B1512	Driver seat buckle switch short to ground
B1513	Passenger seat buckle switch short to battery
B1514	Passenger seat buckle switch short to ground
B1515	Driver seat buckle switch defect
B1516	Passenger seat buckle switch defect
B1620	Internal failure
B1650	Crash recorded (Frontal-Replace SRE-SMART)
B1651	Crash recorded driver side airbag (Side Airbag-Replace SRE-SMART)
B1652	Crash recorded passenger side airbag (Side Airbag-Replace SRE-SMART)
B1657	Crash recorded-belt pretensioner only
B1670	2nd stage crash recorded (Frontal Airbag-Replace SRE-SMART)
B2500	Warning lamp failure

NOTE

- The DAB is located in the steering wheel.
- The PAB is located in the crash pad.
- The DSAB is located in the out side of driver's seat.
- The PSAB is located in the out side of passenger's seat.

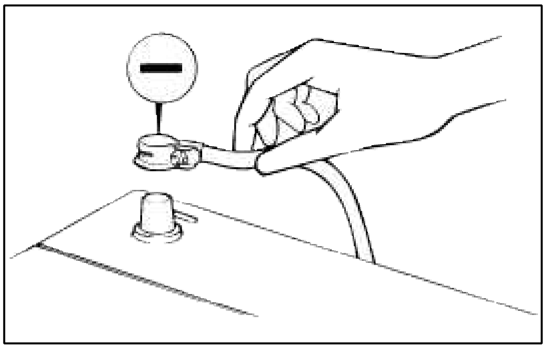
Restraint > Supplemental Restraint System Control Module (SRnodeM) > Repair procedures

REMOVAL

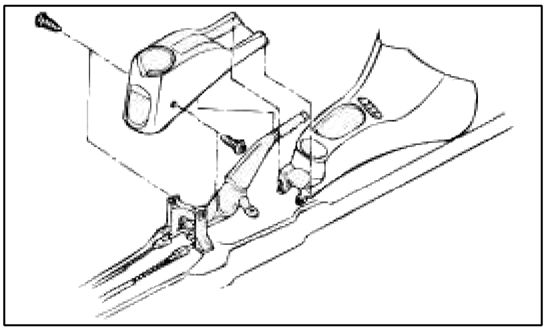
1. Disconnect the negative battery cable and keep secure from battery.

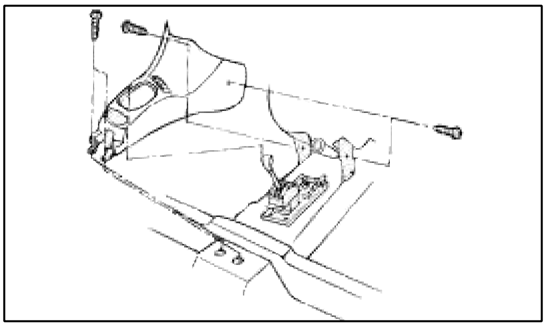
CAUTION

Wait at least 30 seconds after disconnecting the battery cable before doing any further work.



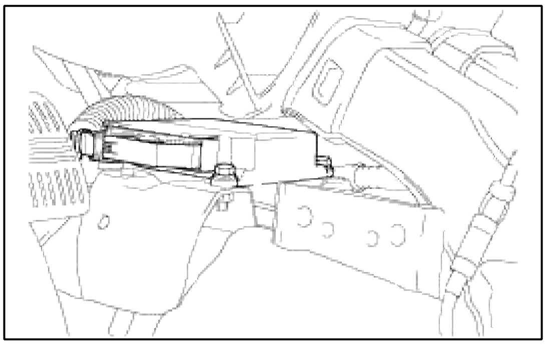
2. Remove the center console mounting bolts (10mm).





3. Remove the center console.
4. Disconnect the SRSCM connector.

5. Remove the SRSCM (10mm).



NOTE

- Do not damage the SRSCM terminals or connectors.
- Do not disassemble the SRSCM; It has no serviceable parts.
- Store the SRSCM in a clean, dry area.
- Do not use any SRSCM which has been subjected to water or shows sign of being dropped or improperly handled, such as dents, cracks or deformation.

6. After installing the SRSCM, confirm proper system operation: Turn the ignition switch ON ; the SRS indicatior light should come on for about six seconds and then go off.

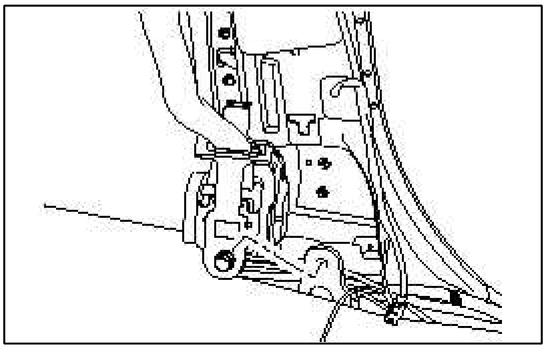
SIDE IMPACT SENSOR REPLACEMENT

REMOVAL

CAUTION

- Removal of the airbag must be performed according to the precautions/procedures decribed before.
- Before disconnecting the side impact sensor 2P connector(s), disconnect the side airbag 2P connector(s).
- Do not turn the ignition switch On and do not connect the battery cable while exchanging the side impact sensor.

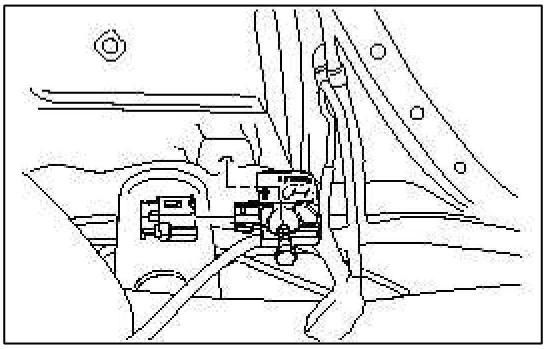
1. Disconnect the negative battery cable, and wait at least three minutes before work.
2. Remove the seat assembly.
3. Remove the front door sill trim.
4. Remove the center pillar trim.
5. Remove the lower anchor bolt.
6. Remove the belt pretensioner.



7. Remove the bolt then remove the side impact sensor.

Torque

8 ~ 10Nm (80 ~ 100kg.cm, 6 ~ 7.4lb.ft)



8. Disconnect the SRS harness 2P connector from the side impact sensor.

INSTALLATION

CAUTION

- Be sure to install the harness wires so that they are not pinched or interfering with other parts.
- Do not turn the ignition switch ON and do not connect the battery cable while exchanging the side impact sensor.

1. Install the new side impact sensor with bolts then connect the SRS harness 2P connector to the side impact sensor.
2. Reinstall belt pretensioner.
3. Reconnect the negative battery cable.
4. After installing the side impact sensor, confirm proper system operation: Turn the ignition switch ON: the SRS indicator light should blink for above six seconds and then go off.

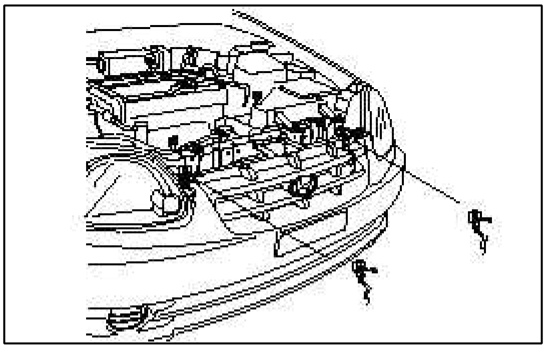
FRONT IMPACT SENSOR REPLACEMENT

REMOVAL

CAUTION

- Removal of the airbag must be performed according to the precautions/ procedures described before.
- Before disconnecting the front impact sensor 2P connector, disconnect the front airbag 4P connector(s).
- Do not turn the ignition switch ON and do not connect the battery cable while exchanging the front impact sensor.

1. Disconnect the negative battery cable and wait at least three minutes before beginning work.
2. Remove the bolt then remove the front impact sensor.
3. Disconnect the SRS harness 2P connector from the front impact sensor.



INSTALLATION

CAUTION

- Be sure to install the harness wire so that they are not pinched or interfering with other parts.
- Do not turn the ignition switch ON and do not contact the battery cable while exchanging the front impact sensor.

1. Install the new front impact sensor with bolt then connect the SRS harness 2P connector to the front impact sensor.
2. Reconnect the negative battery cable.
3. After installing front impact sensor, confirm proper system operation: Turn the ignition switch ON: the SRS indication light should blink for about six seconds and then go off.

Restraint > Airbag Module > Description and Operation

FIELD DEPLOYMENT PROCEDURES

WARNING

When handling the deployed airbag be careful that not the dust enters your eyes and always wear gloves to avoid direct contact with the dust.

AIRBAG MODULE DISPOSAL PROCEDURES

AIRBAG REMOTE DEPLOYMENT DEVICES

Tool, Number, Name	Use
Deployment tool (0957A-34100A) SRS DEPLOYMENT ADAPTER HARNESS DAB, BPT : 0957A-38500 PAB, SAB : 0957A-38100 PAB : 0957A-2500 (Dual stage)	Deployment inside the vehicle (if the vehicle will no longer be driven)

DISPOSAL PLAN

CASE		DISPOSAL PLAN
Abnormal problems in airbag module		Deploy and discard
Car scrapping	DAB, PAB, BPT, SAB	Deploy the airbag module with the SST
Crash (Deployed)		Discard

UNDEPLOYED AIRBAG MODULE DISPOSAL

CAUTION

1. If the vehicle is to be scrapped, junked, or otherwise disposed of, deploy the airbag inside the vehicle.
2. Since there is a loud noise when the airbag is deployed, avoid residential areas whenever possible. If anyone is nearby, give warning of the impending noise.
3. Since a large amount of smoke is produced when the airbag is deployed, select a well-ventilated site. Moreover, never attempt the test near a fire or smoke sensor.

NOTE

When scrapping a car or intentionally deploying the replaced airbag modules, deploy individual stage.

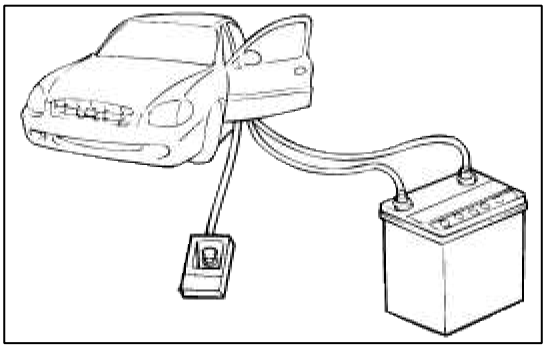
DEPLOYMENT INSIDE THE VEHICLE

when vehicle will no longer be driven

1. Open all windows and doors of the vehicle. Move the vehicle to an isolated spot.
2. Disconnect the negative (-) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

> **WARNING**
>
> Wait at least 30 seconds after disconnecting the battery cable before doing any further work.

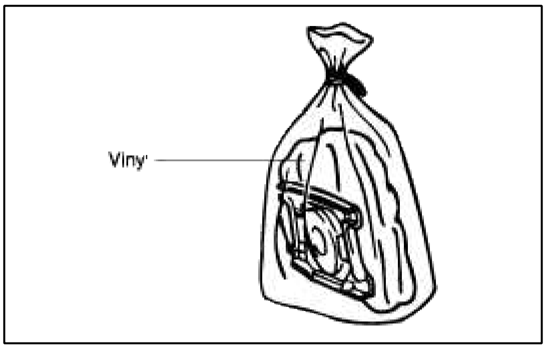
3. Remove the center crash pad side cover.
4. Remove Airbag SRSCM connector.
5. Connect deployment tool to the connector of each module.
6. At location as far away from the vehicle as possible, press the push button (removed from the vehicle) to deploy the airbag.



> **WARNING**
>
> 1. Before deploying the airbag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.
> 2. The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from airbag deployment. See Deployed Airbag Module Disposal Procedures for post-deployment handling instructions.
> 3. If the airbag fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.

DEPLOYED AIRBAG MODULE DISPOSAL PROCEDURES

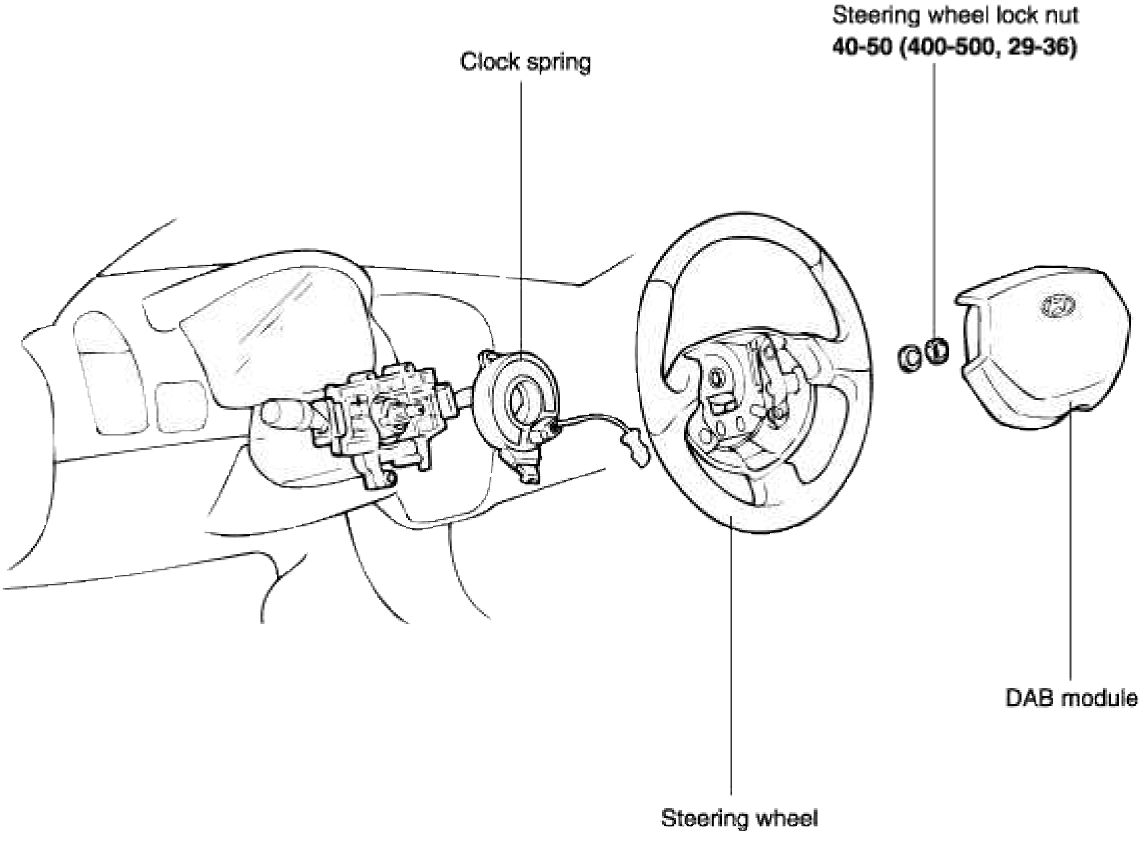
1. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it.
2. Do not put water or oil on the airbag after deployment.
3. There may be adhered to the deployed airbag module, material that could irritate the eyes and/or skin, so wear gloves and safety glasses when handling a deployed airbag module. If despite these precautions, the material does get into your eyes or on your skin, immediately rinse the affected area with a large amount of clean water. If any irritation develops, seek medical attention.
4. Tightly seal the airbag module in a strong vinyl bag for disposal.



5. Be sure to always wash your hands after completing this operation.

Restraint > Airbag Module > Components and Components Location

COMPONENTS


Steering wheel lock nut
40-50 (400-500, 29-36)
Clock spring
DAB module
Steering wheel

TORQUE : Nm (kg·m, lb·t)

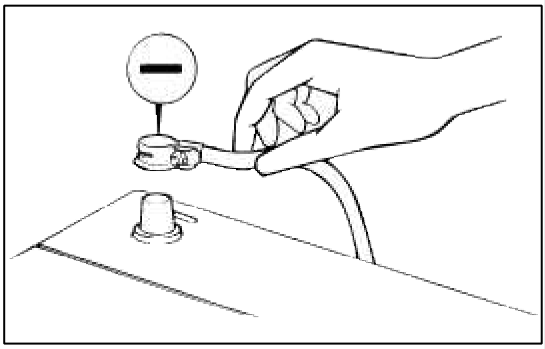
Restraint > Airbag Module > Repair procedures

REMOVAL

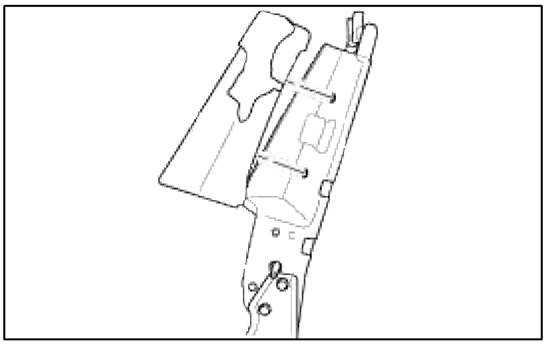
1. Disconnect the battery negative (-) terminal cable.

CAUTION

Wait at least 30 seconds.



2. Disconnect the side airbag harness 2p connector.
3. Remove the seat assembly and seat-back cover.
4. Remove the two mounting nuts and the side airbag.



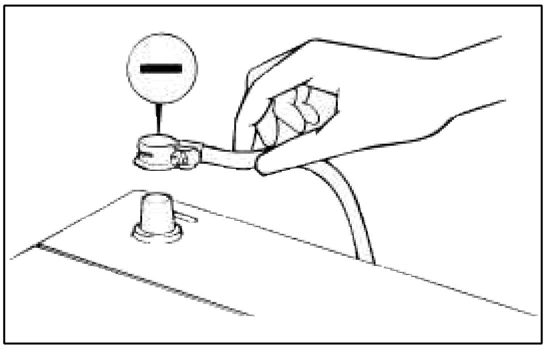
WARNING

1. Never attempt to disassemble or repair the airbag module.
2. Do not drop the airbag module or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust are detected.
3. The airbag module should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.
4. Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

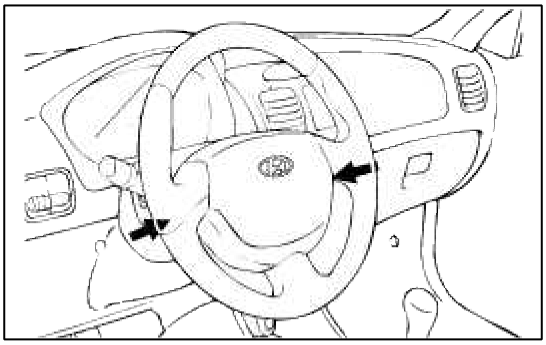
REMOVAL

1. Disconnect the negative battery cable and keep secure from battery.

> **WARNING**
>
> Wait at least 30 seconds after disconnecting the battery cable before doing any further work.

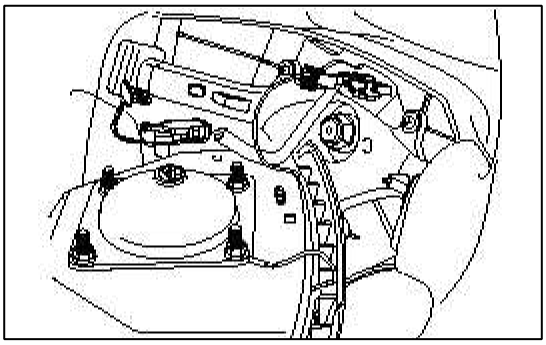


2. Remove the side protect cover of steering wheel and airbag module mounting bolts using a hexagonal wrench.

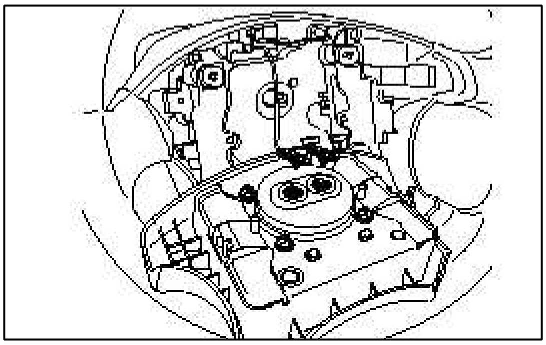


3. Disconnect the drive airbag module connector.

SRE-LC



Dual stage airbag

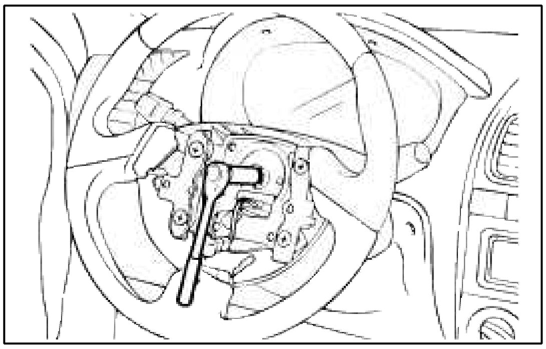


> **WARNING**
>
> The removed airbag module should be stored in a clean, dry place with the pad cover face up.

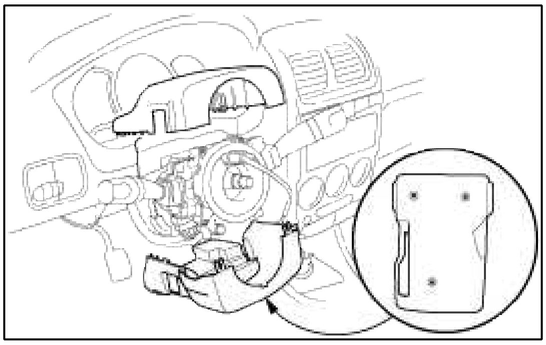
4. Remove the steering wheel using SST (09561-11002).

CAUTION

Do not hammer on the steering wheel. Doing so may damage the collapsible column mechanism.



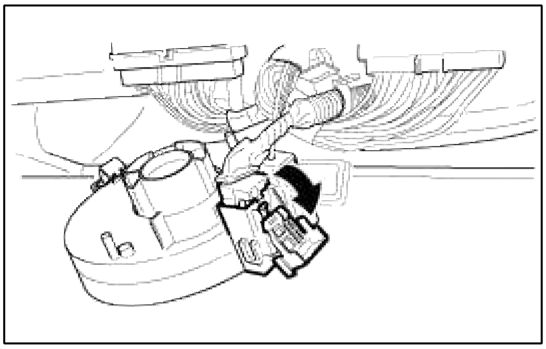
5. Remove the steering column upper shroud and lower shroud.

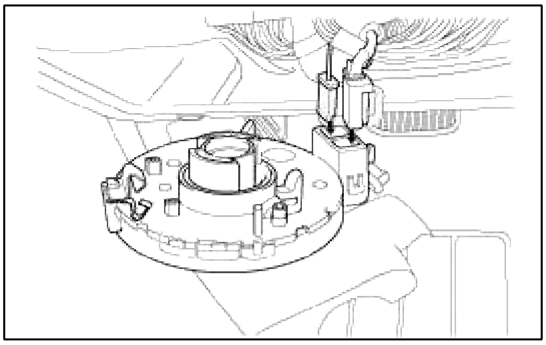


6. When disconnecting the connector of the clock spring from the airbag module, pull the airbag's lock toward the outer side to spread it open.

CAUTION

When disconnecting the airbag module-clock spring connector, take care not to apply excessive force to it.





INSPECTION

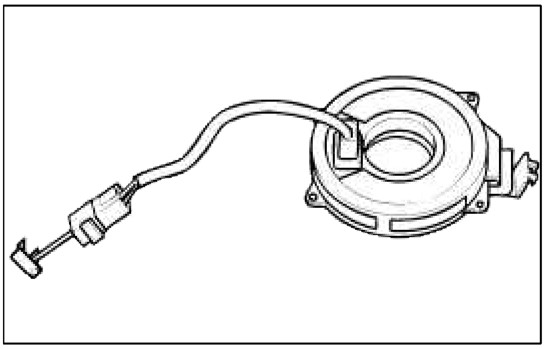
AIRBAG MODULE

WARNING

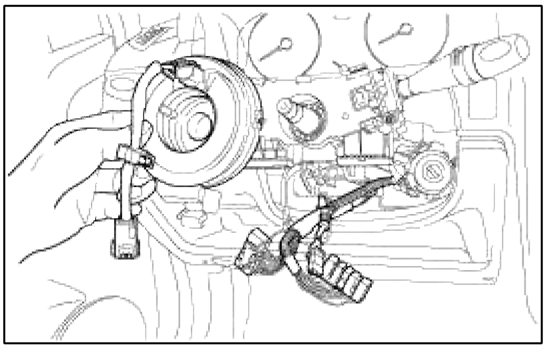
Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.

1. Check pad cover for dents, cracks or deformities.
2. Check the airbag module for denting, cracking or deformation.
3. Check hooks and connectors for damage, terminals for deformities, and harness for binds.
4. Check airbag inflator case for dents, cracks or deformities.
5. Install the airbag module to the steering wheel to check for fit or alignment with the wheel.

CLOCK SPRING



1. If, as a result of the following checks, even one abnormal point is discovered, replace the clock spring with a new one.
2. Check connectors and protective tube for damage, and terminals for deformities.



Restraint > Airbag Module > Passenger Airbag (PAB) Module > Repair procedures

REMOVAL

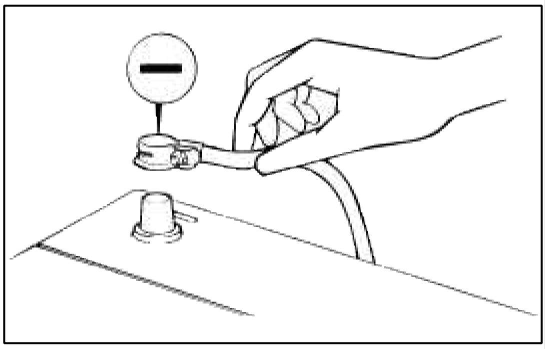
WARNING

1. Never attempt to disassemble or repair the airbag module.
2. Do not drop the airbag module or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust are detected.
3. The airbag module should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.
4. Do not expose the airbag module to temperature over 93°C (200°F)
5. An undeployed airbag module should only be disposed in accordance with the procedures.
6. Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental airbag deployment will result in serious personal injury.
7. Whenever the PAB is deployed it should be replaced with a new one assembled with an extension wire. The squib is melt down if the PAB is deployed making the extension wire useless.

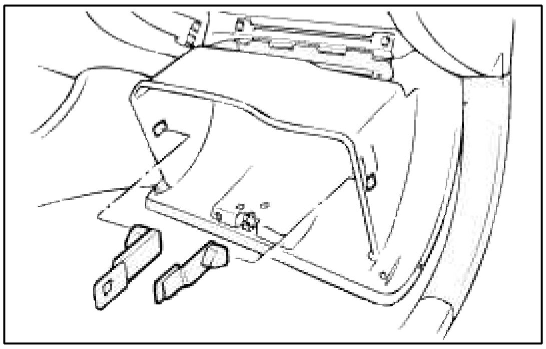
1. Disconnect the battery negative (-) terminal cable.

CAUTION

Wait at least 30 seconds.

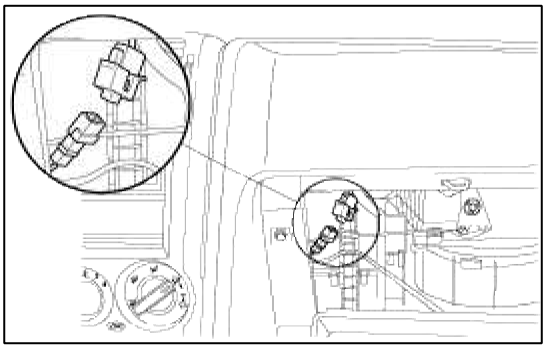


2. Remove the glove box.

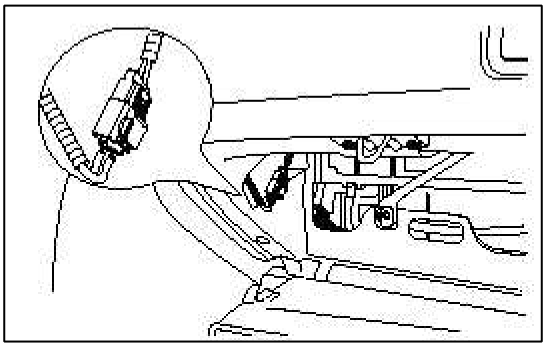


3. Disconnect the PAB module connector.

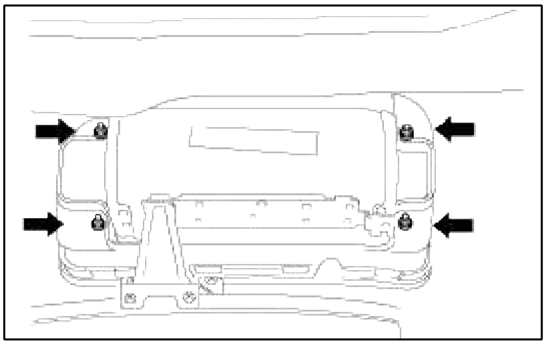
SRE-LC

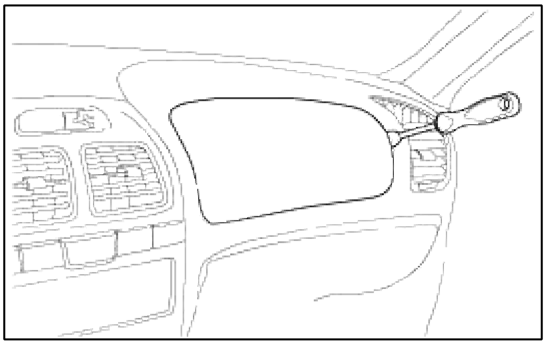


Dual stage airbag



4. Remove the crash pad assembly and then undo the PAB module. (Refer to the BD section)





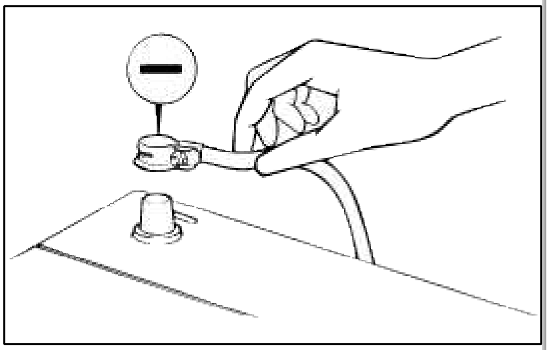
Restraint > Seat Belt Pretensioner > Seat Belt Retractor Pretensioner (BPT) > Repair procedures

REMOVAL

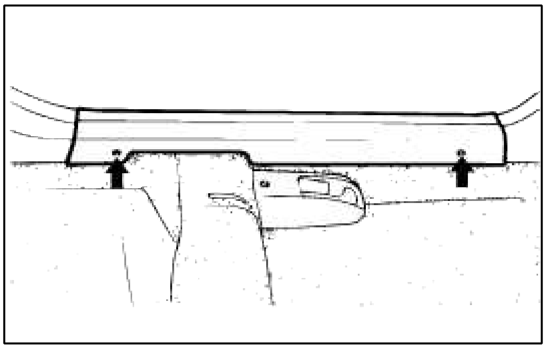
1. Disconnect the battery negative (-) terminal.

   WARNING

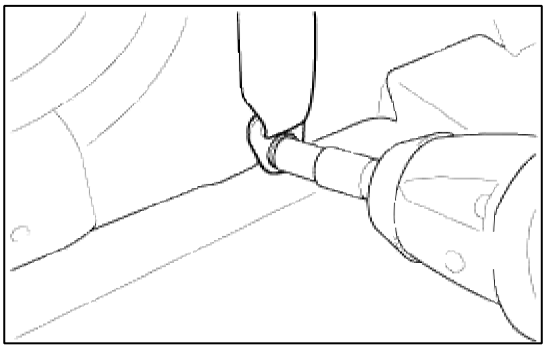
   Wait at least 30 seconds.

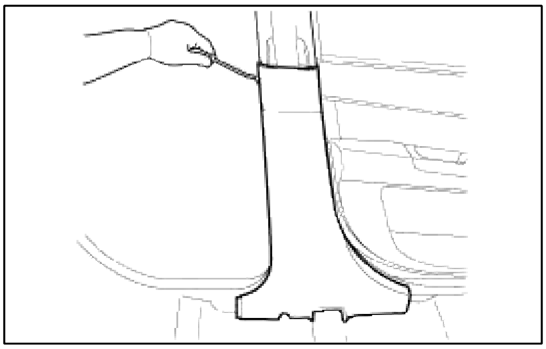
2. Remove the door scuff trim.

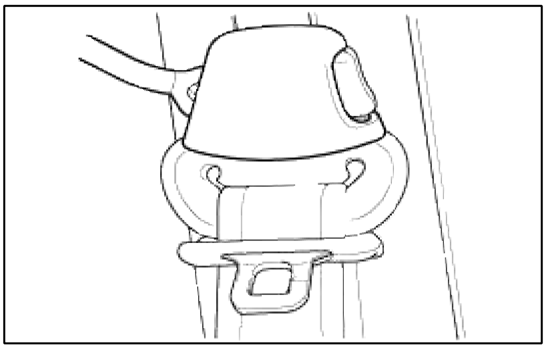
3. Remove the lower anchor plate cover and lower anchor plate.

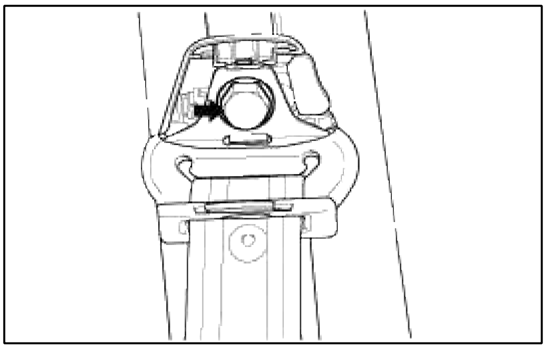
   

4. Remove the center pillar lower trim.

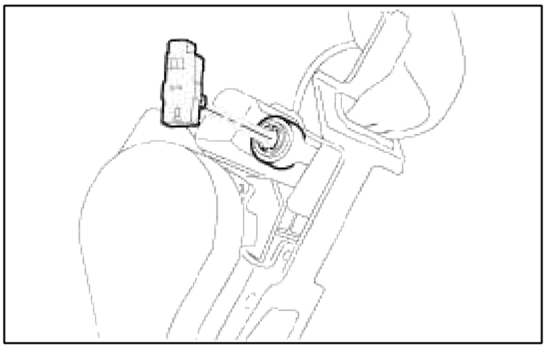
   

5. Remove the upper anchor plate cover and upper anchor plate.

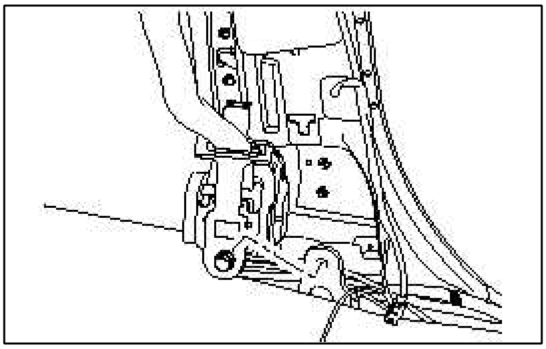




6. Disconnect the belt pretensioner connector.



7. Remove the front seat belt.



WARNING

1. Never attempt to disassemble or repair the BPT.
2. Do not drop the BPT or allow contact with water, grease, oil. Replace it if a dent, crack, deformation or rust are detected.
3. Do not place anything on the BPT.
4. Do not expose the BPT to temperature over 93°C(200°F).
5. BPT functions one time only. Be sure to replace the BPT after it is deployed.
6. Be sure to wear gloves and safety goggles when handling the deployed BPT.

Restraint > Troubleshooting > B1101

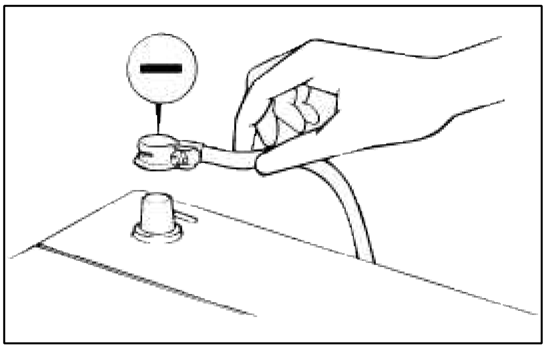
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1101 Battery voltage too high B1102 Battery voltage too low B1103 Communication voltage too low

CIRCUIT DESCRIPTION

INSPECTION PROCEDURE

1. Preparation
   - A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   - B. Remove the DAB module.
   - C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   - D. Disconnect the SRSCM connector.

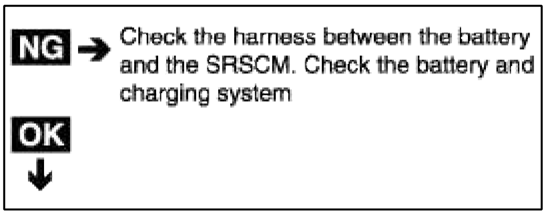


WARNING

Place the DAB with the front surface facing upward.

2. Check source voltage.
   - A. Connect the negative (-) terminal cable to the battery.
   - B. Turn the ignition switch ON.

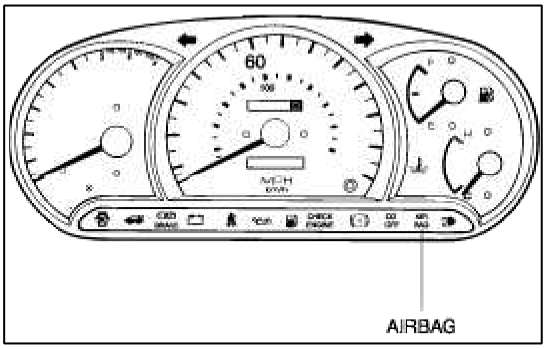
     LIMIT : 10 ~ 16.5V



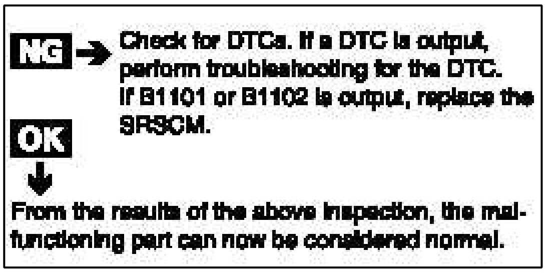
NG → Check the harness between the battery and the SRSCM. Check the battery and charging system

OK ↓

3. Does the SRS warning light turn off ?
   - A. Turn the ignition switch to LOCK.
   - B. Connect the DAB module.
   - C. Connect the PAB connector, left and right side airbag, belt pretensioner and satellite connectors.
   - D. Connect the SRSCM connector.
   - E. Turn the ignition switch ON.



(1)



NG → Check for DTCs. If a DTC is output, perform troubleshooting for the DTC. If B1101 or B1102 is output, replace the SRSCM.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1111

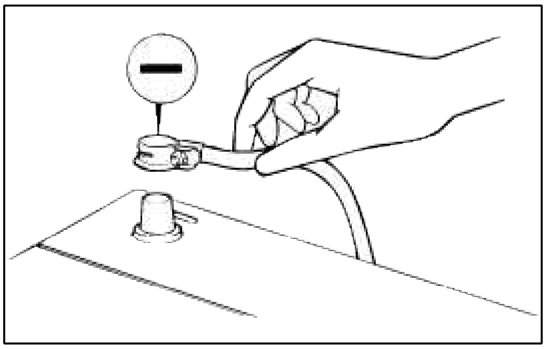
CIRCUIT INSPECTION (SRE-LC)

DTC	B1111 Battery voltage too high B1112 Battery voltage too low

CIRCUIT DESCRIPTION

INSPECTION PROCEDURE

1. Preparation
   - A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   - B. Remove the DAB module.
   - C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   - D. Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

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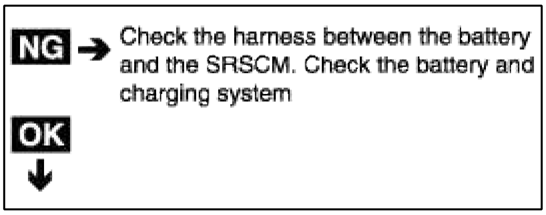
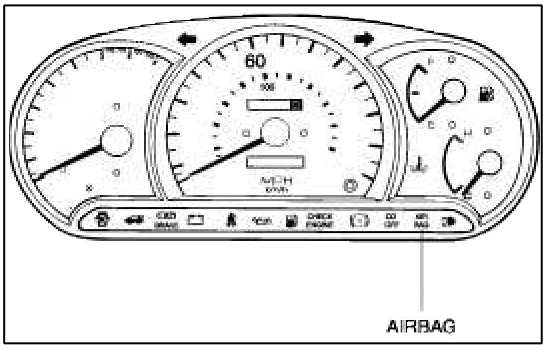
2. Check source voltage.
   A. Connect the negative (-) terminal cable to the battery.
   B. Turn the ignition switch ON.
   LIMIT : 9 ~ 16V

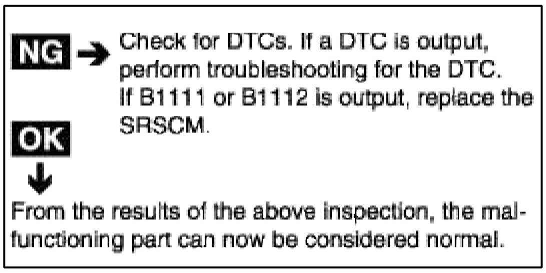


NG → Check the harness between the battery and the SRSCM. Check the battery and charging system

OK
↓

3. Does the SRS warning light turn off ?
   A. Turn the ignition switch to LOCK.
   B. Connect the DAB module.
   C. Connect the PAB connector, left and right side airbag, belt pretensioner and satellite connectors.
   D. Connect the SRSCM connector.
   E. Turn the ignition switch ON.





NG → Check for DTCs. If a DTC is output, perform troubleshooting for the DTC. If B1111 or B1112 is output, replace the SRSCM.

OK
↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1326

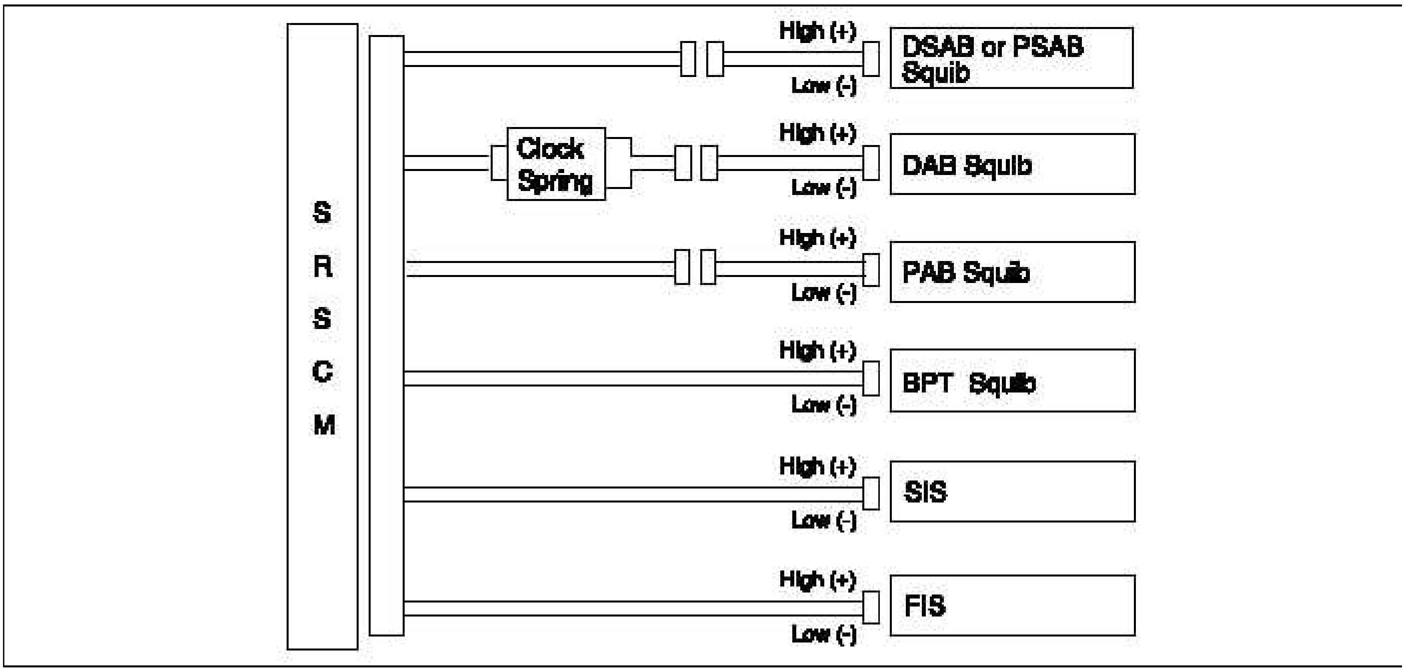
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1326 Driver side front impact sensor short to ground B1331 Passenger side front impact sensor short to ground B1348 1st stage DAB Short to ground B1354 1st stage PAB Short to ground B1363 DBPT Short to ground B1369 PBPT Short to ground B1380 DSAB Short to ground B1384 PSAB Short to ground B1401 Side impact sensor driver side short to ground B1404 Side impact sensor passenger side short to ground B1483 2nd stage DAB short to ground B1487 2nd stage PAB short to ground

CIRCUIT DESCRIPTION

DTC Detecting Condition	Trouble Area	
• Short circuit in squib wire harness (to ground) • Squib malfunction • Clock spring malfunction • SRSCM malfunction	• 1st stage DAB squib • 1st stage PAB squib • DSAB squib • PSAB squib • BPT squib • Side impact sensor • Clock spring • SRSCM • Wire harness	• 2nd stage DAB squib • 2nd stage PAB squib • Front impact sensor

WIRING DIAGRAM


SRSCM
Clock Spring
High (+)
Low (-)
DSAB or PSAB Squib
DAB Squib
PAB Squib
BPT Squib
SIS
FIS

INSPECTION PROCEDURE

1. Preparation
   A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   B. Remove the DAB module.
   C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.

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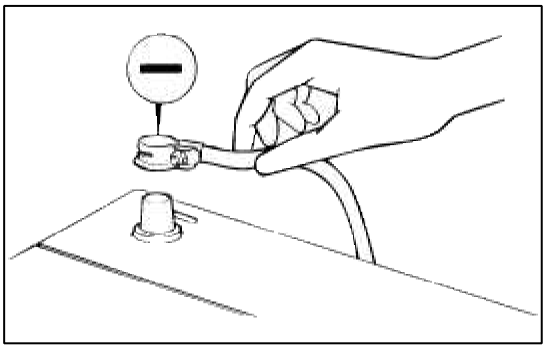
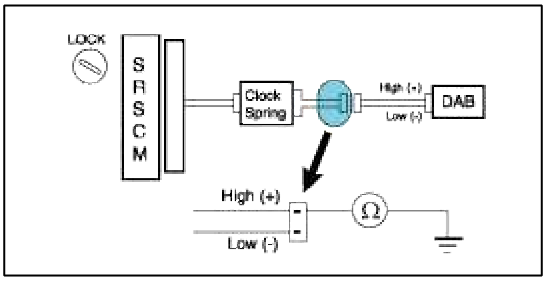
D. Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

2. Check the DAB squib circuit.

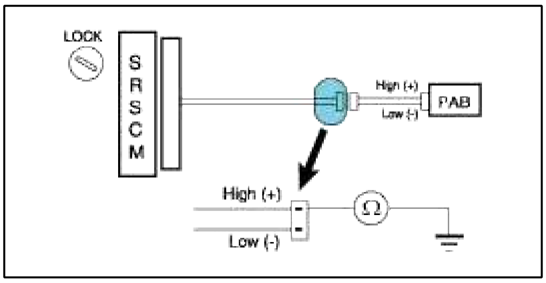

LOCK
SRSCM
Clock Spring
High (+)
Low (-)
DAB
High (+)
Low (-)
Ω

[CHECK]
For the connector (on the clock spring side) between the clock spring and the DAB, measure the resistance between the DAB high and body ground.
Resistance: ∞

NG → Go to step "15"

OK
↓
Go to step "9"

3. Check the PAB squib circuit.

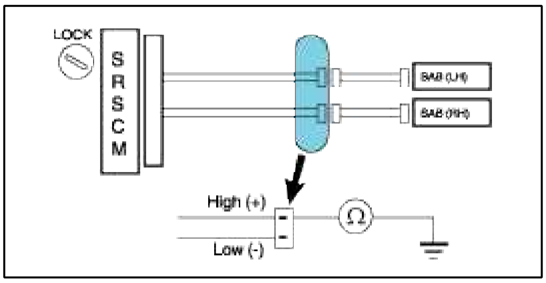

LOCK
SRSCM
High (+)
Low (-)
PAB
High (+)
Low (-)
Ω

[CHECK]
For the connector (on the SRSCM side) between the SRSCM and the PAB, measure the resistance between the PAB high and body ground.
Resistance: ∞

NG → Repair or replace the harness or the connector between the SRSCM and the PAB.

OK
↓
Go to step "10"

4. Check the PSAB and DSAB squib circuit.


LOCK
S
R
S
C
M
SAB (LH)
SAB (RH)
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the SAB, measure the resistance between the SAB high and body ground.

Resistance: ∞

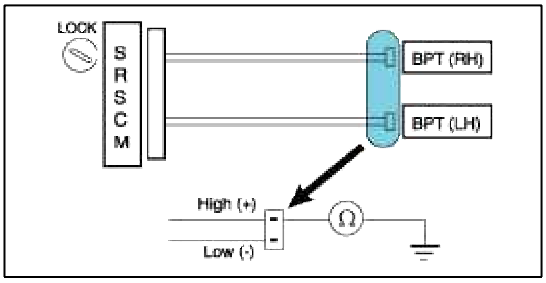
NG ➔ Repair or replace the harness between the SRSCM and the SAB.

OK

↓

Go to step "11"

5. Check the BPT squib circuit.


LOCK
S
R
S
C
M
BPT (RH)
BPT (LH)
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the BPT, measure the resistance between the BPT high and body ground.

Resistance: ∞

NG ➔ Repair or replace the harness between the SRSCM and the BPT.

OK

↓

Go to step "12"

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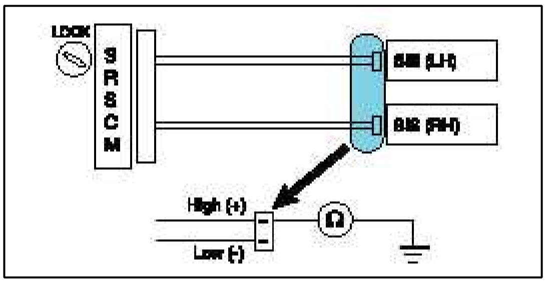
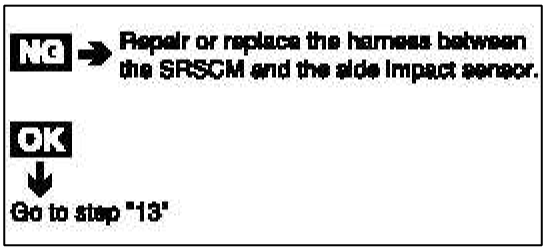
6. Check the side impact sensor circuit.



[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the side impact sensor, measure the resistance between the side impact sensor high and body ground.

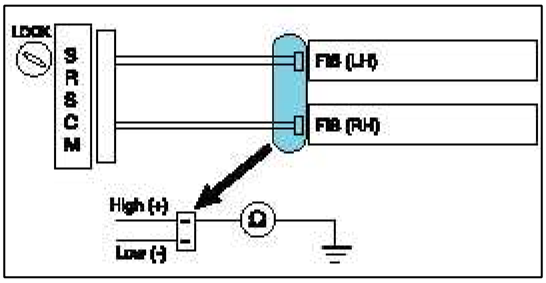
Resistance: ∞



NG → Repair or replace the harness between the SRSCM and the side impact sensor.

OK
↓
Go to step "13"

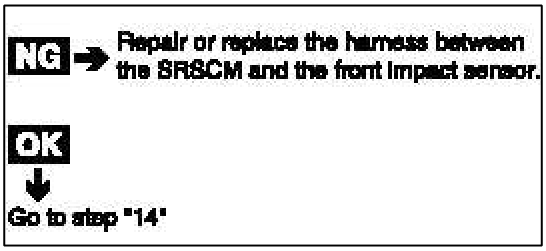
7. Check the side impact sensor circuit.



[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the front impact sensor, measure the resistance between the front impact sensor high and body ground.

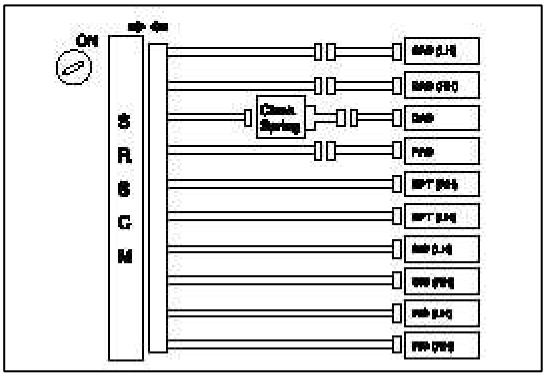
Resistance: ∞



NG → Repair or replace the harness between the SRSCM and the front impact sensor.

OK
↓
Go to step "14"

8. Check the SRSCM.
   A. Connect the connector to the SRSCM.
   B. Using a service wire, connect the DAB high and the DAB low to the clock spring side connector between the clock spring and the DAB.
   C. Using a service wire, connect the PAB high and low on the SRSCM side of the connector between the SRSCM and the PAB.
   D. Connect the SAB, the BPT, the FIS and the SIS by the same method.
   E. Connect the negative (-) terminal cable to the battery, and wait least 30 seconds.



   A. Turn the ignition switch to ON, and wait at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using Hi-Sacn Pro, check the DTC.

   There is no DTC.

   [HINT]

   Codes other than these ones may be output at this time, but they are not relevant to this check.

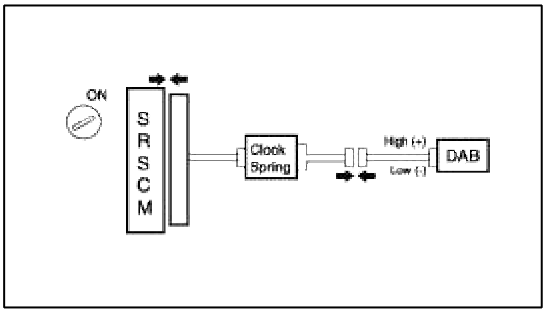
NG → Replace the SRSCM.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

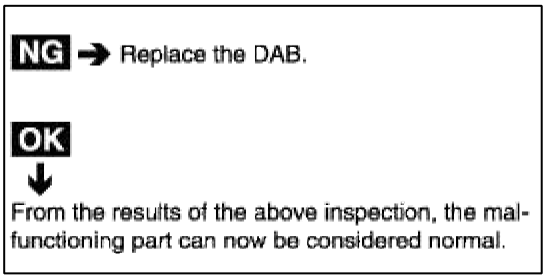
9. Check the DAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the the DAB connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.



   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.

E. Using the Hi-scan, check the DTC.

There is no DTC.



NG → Replace the DAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

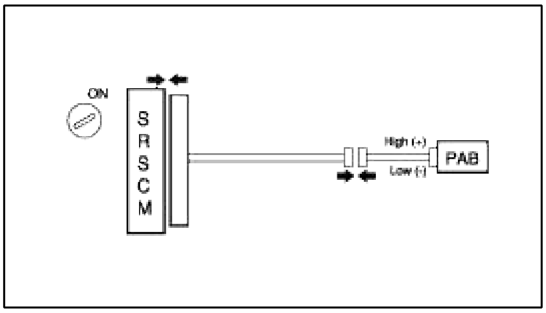
10. Check the PAB squib.

A. Turn the ignition switch to LOCK.

B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.

C. Connect the the PAB connector.

D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



A. Turn the ignition switch to ON, and wait for at least 30 seconds.

B. Clear the malfunction code stored in the memory with Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait for 30 seconds.

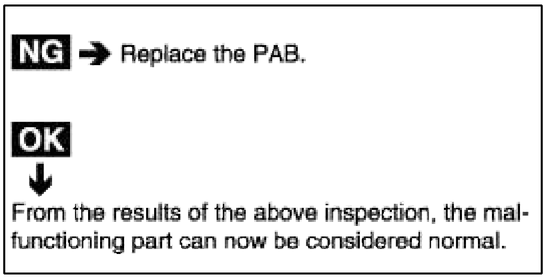
D. Turn the ignition switch to ON, and wait for 30 seconds.

E. Using the Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the PAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

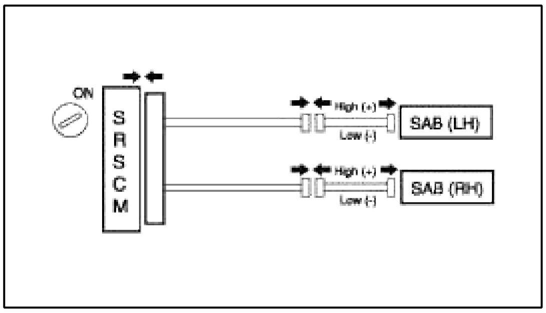
11. Check the SAB squib.

A. Turn the ignition switch to LOCK.

B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.

C. Connect the the SAB connector.

D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



A. Turn the ignition switch to ON, and wait for at least 30 seconds.

B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait for 30 seconds.

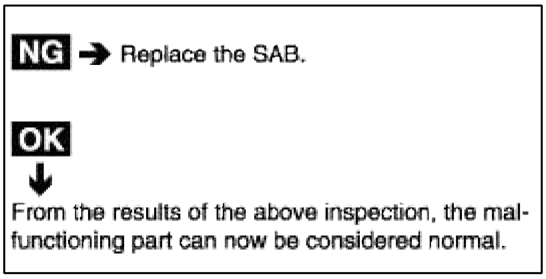
D. Turn the ignition switch ON, and wait for 30 seconds.

E. Using the Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG ➔ Replace the SAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

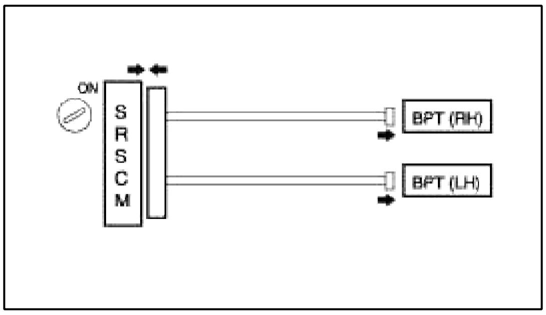
12. Check the BPT squib.

A. Turn the ignition swich to LOCK.

B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.

C. Connect the BPT connector.

D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



A. Turn the ignition switch to ON, and wait for 30 seconds.

B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait for 30 seconds.

D. Turn the ignition switch to ON, and wait for 30 seconds.

E. Using the Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.

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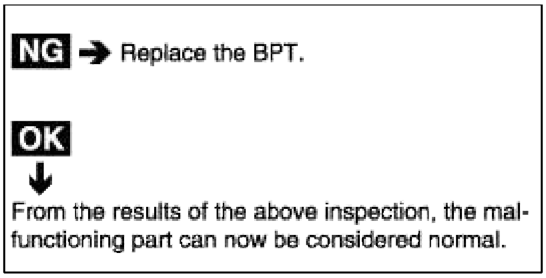


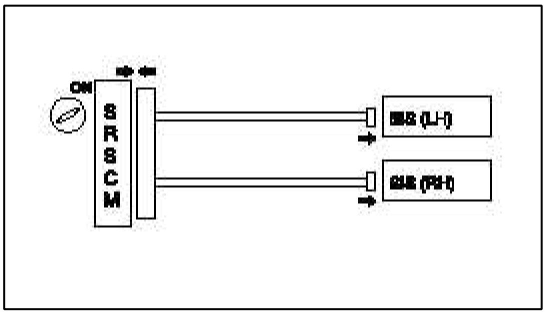
NG → Replace the BPT.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

13. Check the side impact sensors.
    A. Turn ignition switch to LOCK.
    B. Disconnect negative (-) terminal cable from the battery, and wait at least 30 seconds.
    C. Connect the side impact sensor connector.
    D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

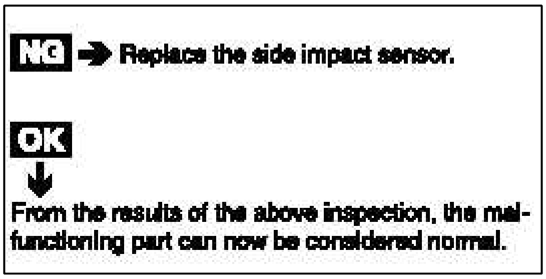


A. Turn the ignition switch to ON, and wait at least 30 seconds.
B. Clear the malfunction code stored in memory with the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
D. Turn the ignition switch to ON, and wait at least 30 seconds.
E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



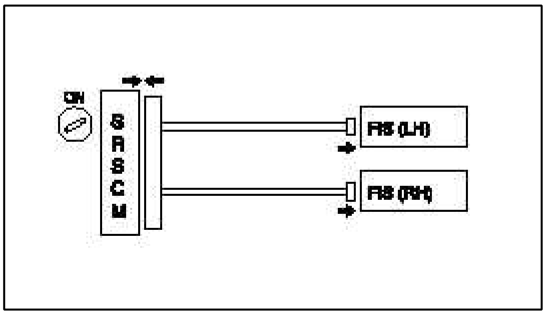
NG → Replace the side impact sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

14. Check the front impact sensors.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    C. Connect the front impact sensor connector.
    D. Commect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

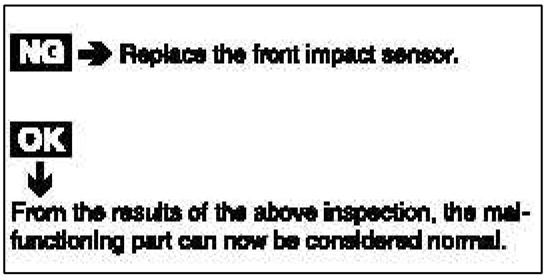


    A. Turn the ignition switch to ON, and wait at least 30 seconds.
    B. Clear the malfunction code stored in memory with the Hi-Scan Pro.
    C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
    D. Turn the ignition switch to ON, and wait at least 30 seconds.
    E. Using the Hi-Scan Pro, check for DTCs.

There is noDTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.

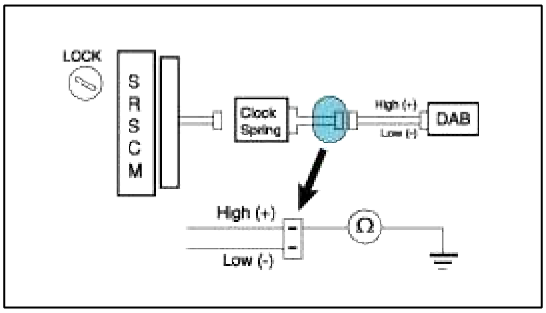


NG → Replace the front impact sensor.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal.

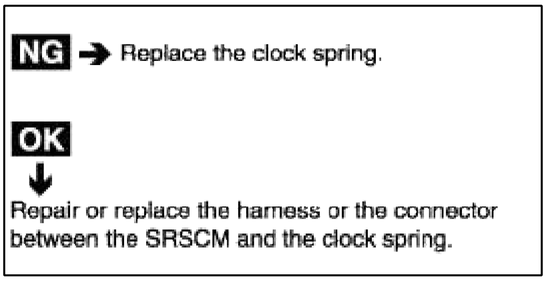
15. Check the clock spring circuit.



[CHECK]

Measure the resistance between the DAB high on the clock spring side of the connector between the clock spring and the DAB and body ground.

Resistance: ∞



NG → Replace the clock spring.

OK

Repair or replace the harness or the connector between the SRSCM and the clock spring.

Restraint > Troubleshooting > B1327

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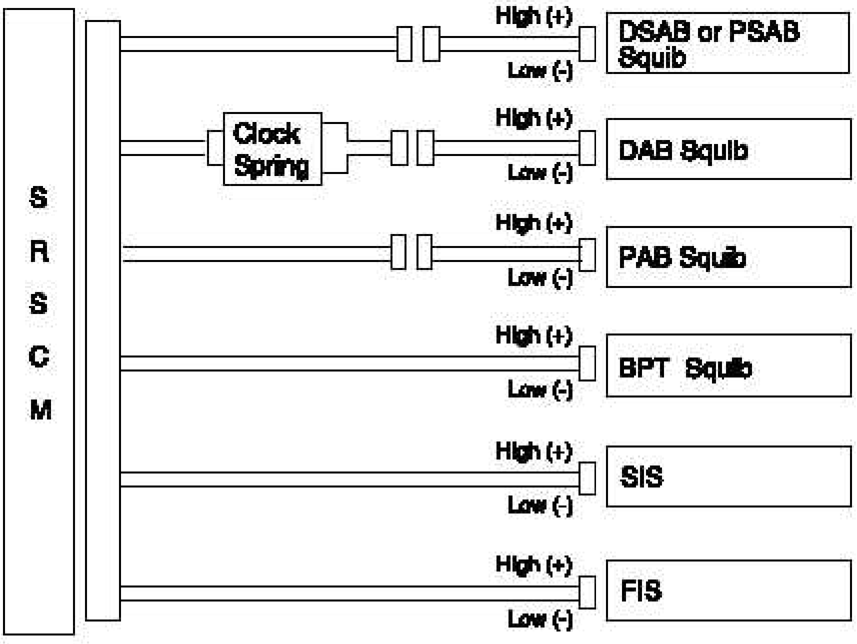
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1327 Driver side front impact sensor short to battery B1332 Passenger side front impact sensor short to battery B1349 1st stage DAB Short to battery B1355 1st stage PAB Short to battery B1364 BPT (Driver) Short to battery B1370 BPT (Passenger) Short to battery B1381 SAB (Driver) short to battery B1385 SAB (Passenger) short to battery B1402 Side impact sensor driver side short to battery B1405 Side impact sensor passenger side short to battery B1484 2nd stage DAB shrot to battery B1488 2nd stage PAB short to battery

CIRCUIT DESCRIPTION

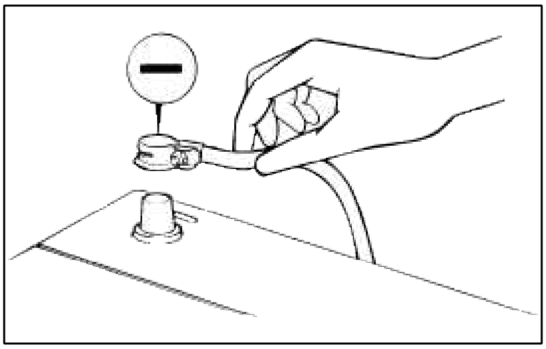
DTC Detecting Condition	Trouble Area	
• Short circuit in squib wire harness (to B+) • Squib malfunction • Spiral cable malfunction • SRSCM malfunction	• 1st stage DAB squib • 1st stage PAB squib • DSAB or PSAB squib • BPT squib • Side impact sensor • Wire harness	• 2nd stage DAB squib • 2nd stage PAB squib • Front impact sensor

WIRING DIAGRAM



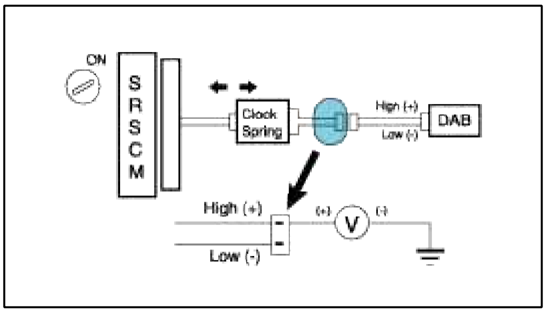
INSPECTION PROCEDURE

1. Preparation
   A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   B. Remove the DAB module.
   C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   D. Disconnect the SRSCM connector.



> **WARNING**
>
> Place the DAB with the front surface facing upward.

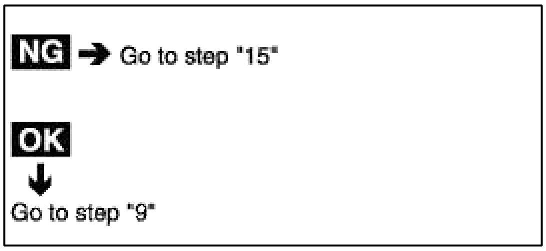
2. Check the DAB squib circuit.



[CHECK]

For the connector (on the clock spring side) between the clock spring and the DAB, measure the voltage between the DAB high and body ground.

Voltage : 0 V



NG ➔ Go to step "15"

OK

↓

Go to step "9"

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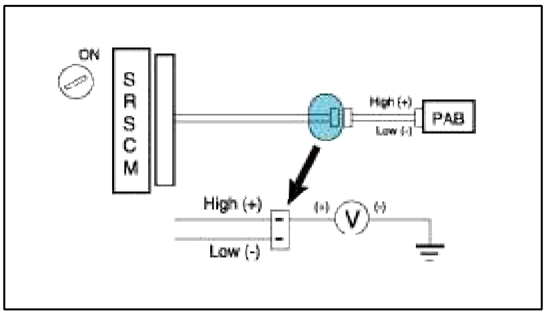
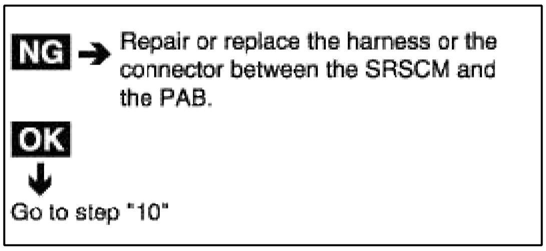
3. Check the PAB squib circuit.


ON
SRSCM
High (+)
Low (-)
PAB
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the PAB, measure the voltage between the PAB high and body ground.

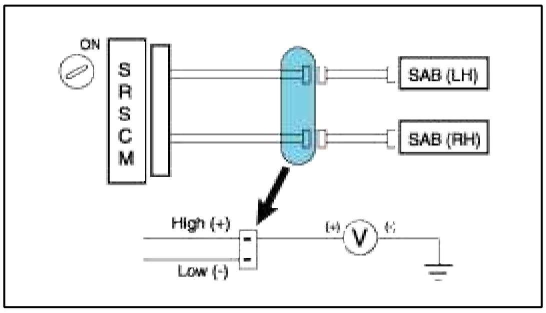
Voltage : 0 V



NG → Repair or replace the harness or the connector between the SRSCM and the PAB.

OK
↓
Go to step "10"

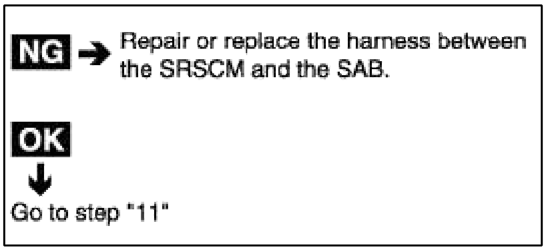
4. Check the SAB squib circuit.


ON
SRSCM
SAB (LH)
SAB (RH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the SAB, measure the voltage between the SAB high and body ground.

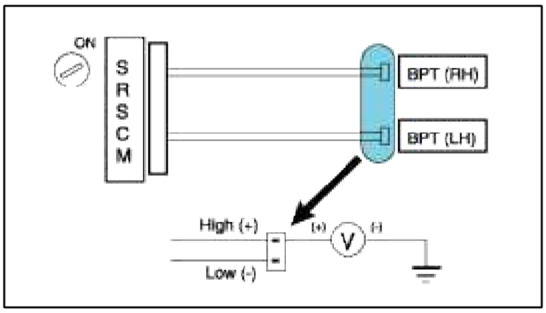
Voltage : 0 V



NG → Repair or replace the harness between the SRSCM and the SAB.

OK
↓
Go to step "11"

5. Check the BPT squib circuit.


ON
SRSCM
BPT (RH)
BPT (LH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

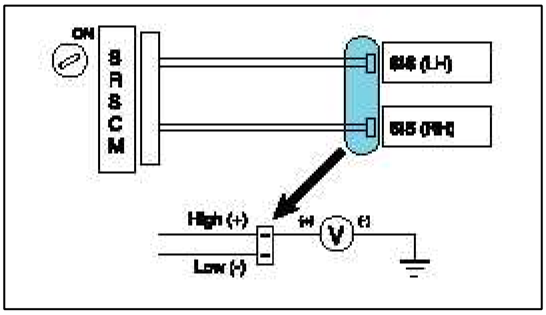
For the connector between the SRSCM and the BPT, measure the voltage between the BPT high and body ground.

Voltage : 0 V

NG ➔ Repair or replace the harness between the SRSCM and the BPT.

OK
↓
Go to step "12"

6. Check the side impact sensor circuit.


ON
SRSCM
SIS (LH)
SIS (RH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

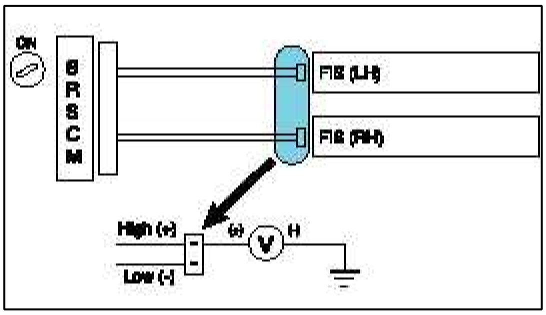
For the connector between the SRSCM and the side impact sensor, measure the voltage between the side impact sensor high and body ground.

Voltage : 0 V

NG ➔ Repair or replace the harness between the SRSCM and the side impact sensor.

OK
↓
Go to step "13"

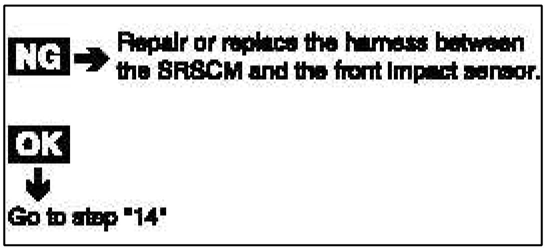
7. Check the front impact sensor circuit.



[CHECK]

For the connector between the SRSCM and the front impact sensor, measure the voltage between the front impact sensor high and body ground.

Voltage : 0 V



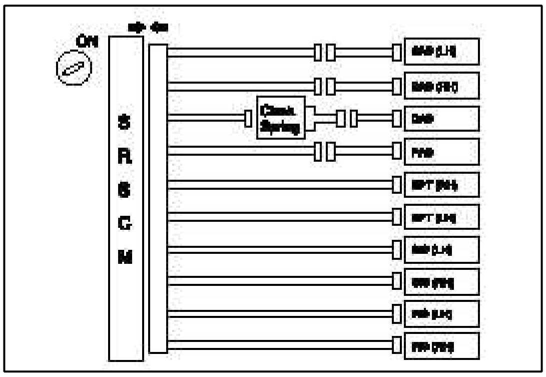
NG ➔ Repair or replace the harness between the SRSCM and the front impact sensor.

OK

↓

Go to step "14"

8. Check the SRSCM.

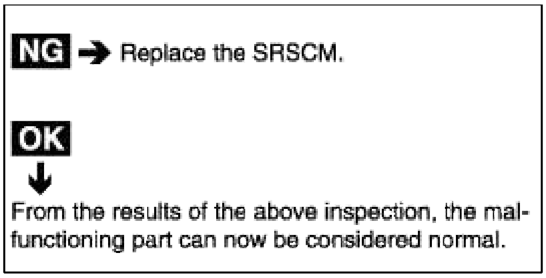


A. Connect the connector to the SRSCM.
B. Using a service wire, connect the DAB high and low on the clock spring side of the connector between the clock spring and the DAB.
C. Using a service wire, connect the PAB high and low on the SRSCM side of the connector between the SRSCM and the PAB.
D. Using a service wire, connect the SAB, BPT, FIS and by the same method.
E. Connect negative (-) battery cable to the battery, and wait at least 30 seconds.
A. Turn the ignition switch to ON, and wait at least 30 seconds.
B. Clear the malfunction code stored in memory with Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
D. Turn the ignition switch to ON, and wait at least 30 seconds.
E. Using Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.



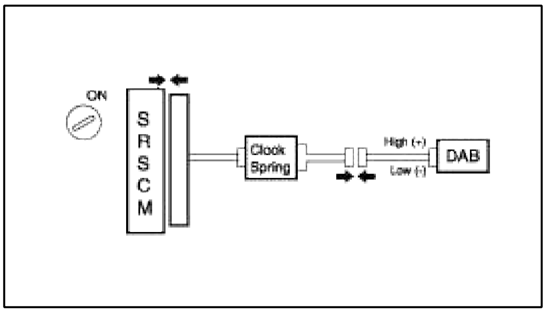
NG → Replace the SRSCM.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

9. Check the DAB squib.
   - A. Turn the ignition switch to LOCK.
   - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   - C. Connect the DAB connector.
   - D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

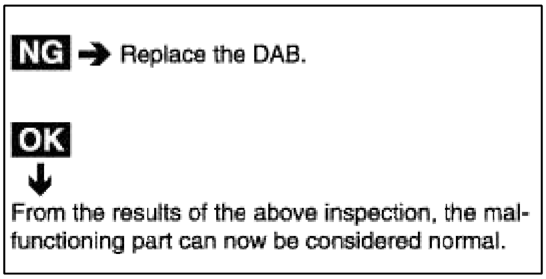


- A. Turn the ignition switch to ON, and wait for at least 30 seconds.
- B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
- C. Turn the ignition switch to LOCK, and wait for 30 seconds.
- D. Turn the ignition switch to ON, and wait for 30 seconds.
- E. Using Hi-Scan Pro, check the DTC.

  There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the DAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

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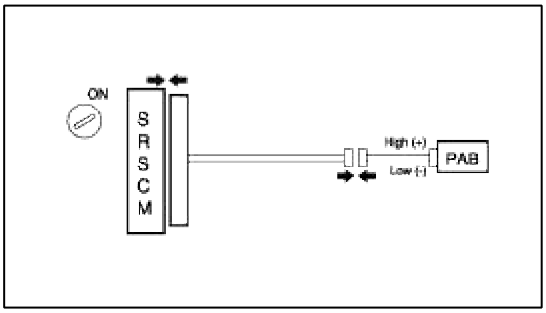
10. Check the PAB squib.

A. Turn the ignition switch to LOCK.

B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.

C. Connect the the PAB connector.

D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



A. Turn the ignition switch to ON, and wait for at least 30 seconds.

B. Clear the malfunction code stored in the memory with Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait for 30 seconds.

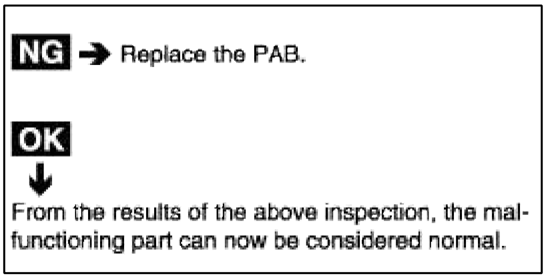
D. Turn the ignition switch ON, and wait for 30 seconds.

E. Using the Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the PAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

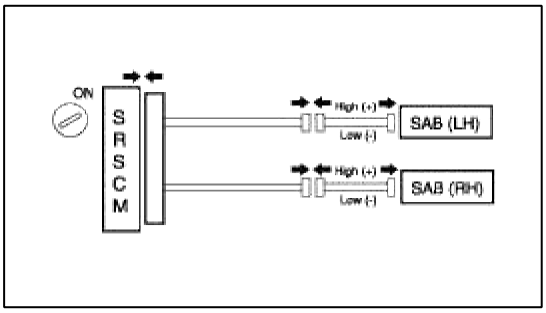
11. Check the SAB squib.

A. Turn the ignition switch to LOCK.

B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.

C. Connect the SAB connector.

D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



A. Turn the ignition switch to ON, and wait for at least 30 seconds.

B. Clear the malfunction code stored in the memory with Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait for 30 seconds.

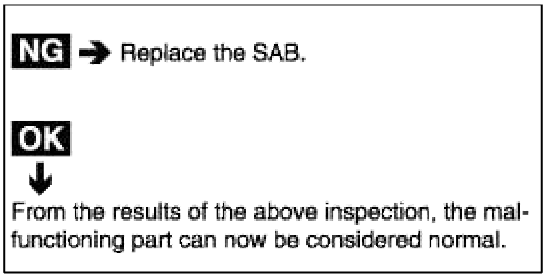
D. Turn the ignition switch ON, and wait for 30 seconds.

E. Using the Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

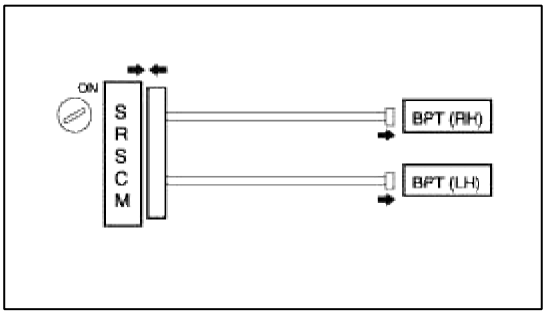
Codes other than these ones may be output at this time, but they are not relevant to this checking procedure.



NG → Replace the SAB.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

12. Check the BPT squib.
    A. Turn the ignition swich to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the the BPT connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

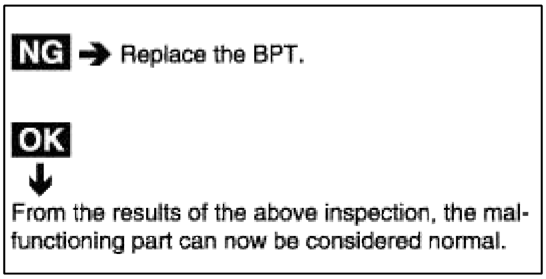


A. Turn the ignition switch to ON, and wait for 30 seconds.
B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch to ON, and wait for 30 seconds.
E. Using the Hi-Scan Pro check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the BPT.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

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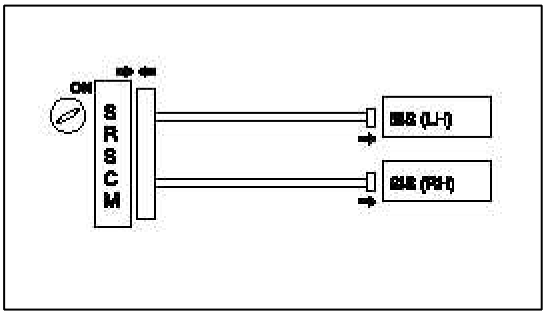
13. Check the side impact sensors.
    A. Turn ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    C. Connect the side impact sensor connector.
    D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.



A. Turn the ignition switch to ON, and wait at least 30 seconds.
B. Clear the malfunction code stored in memory with Hi-scan Pro.
C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
D. Turn the ignition switch to ON, and wait at least 30 seconds.
E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

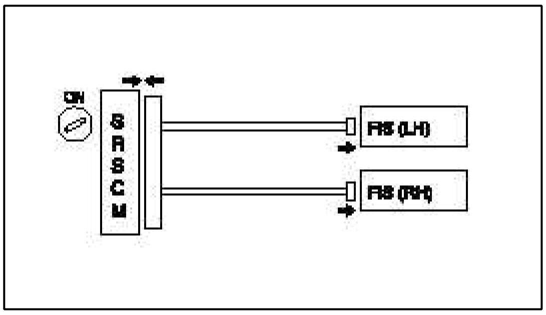
[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.

NG ➔ **Replace the side impact sensor.**

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

14. Check the front impact sensors.
    A. Turn ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    C. Connect the front impact sensor connector
    D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

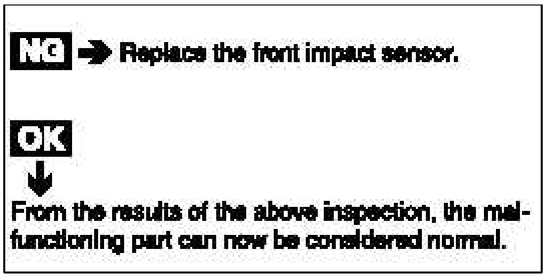


A. Turn the ignition switch to ON, and wait at least 30 seconds.
B. Clear the malfunction code stored in memory with Hi-scan.
C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
D. Turn the ignition switch to ON, and wait at least 30 seconds.
E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure

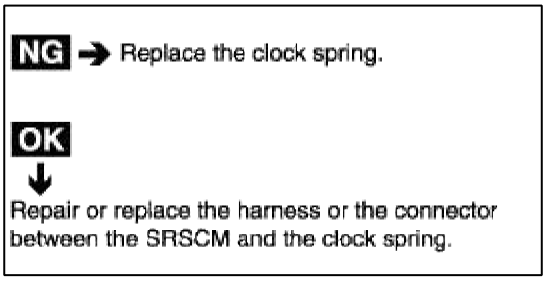


NG → Replace the front impact sensor.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

15. Check the clock spring.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the connector between the SRSCM and the clock spring.

1. **[CHECK]**
   Turn the ignition switch to ON, and measure voltage between the DAB high and body ground.
   Voltage : 0 V



NG → Replace the clock spring.

OK
↓
Repair or replace the harness or the connector between the SRSCM and the clock spring.

Restraint > Troubleshooting > B1328

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1328 Front impact sensor driver side defect B1329 Front impact sensor driver communication error B1330 Front impact sensor driver side wrong ID B1333 Front impact sensor passenger side defect B1334 Front impact sensor passenger communication error B1335 Front impact sensor passenger side wrong ID

CIRCUIT DESCRIPTION
WIRING DIAGRAM

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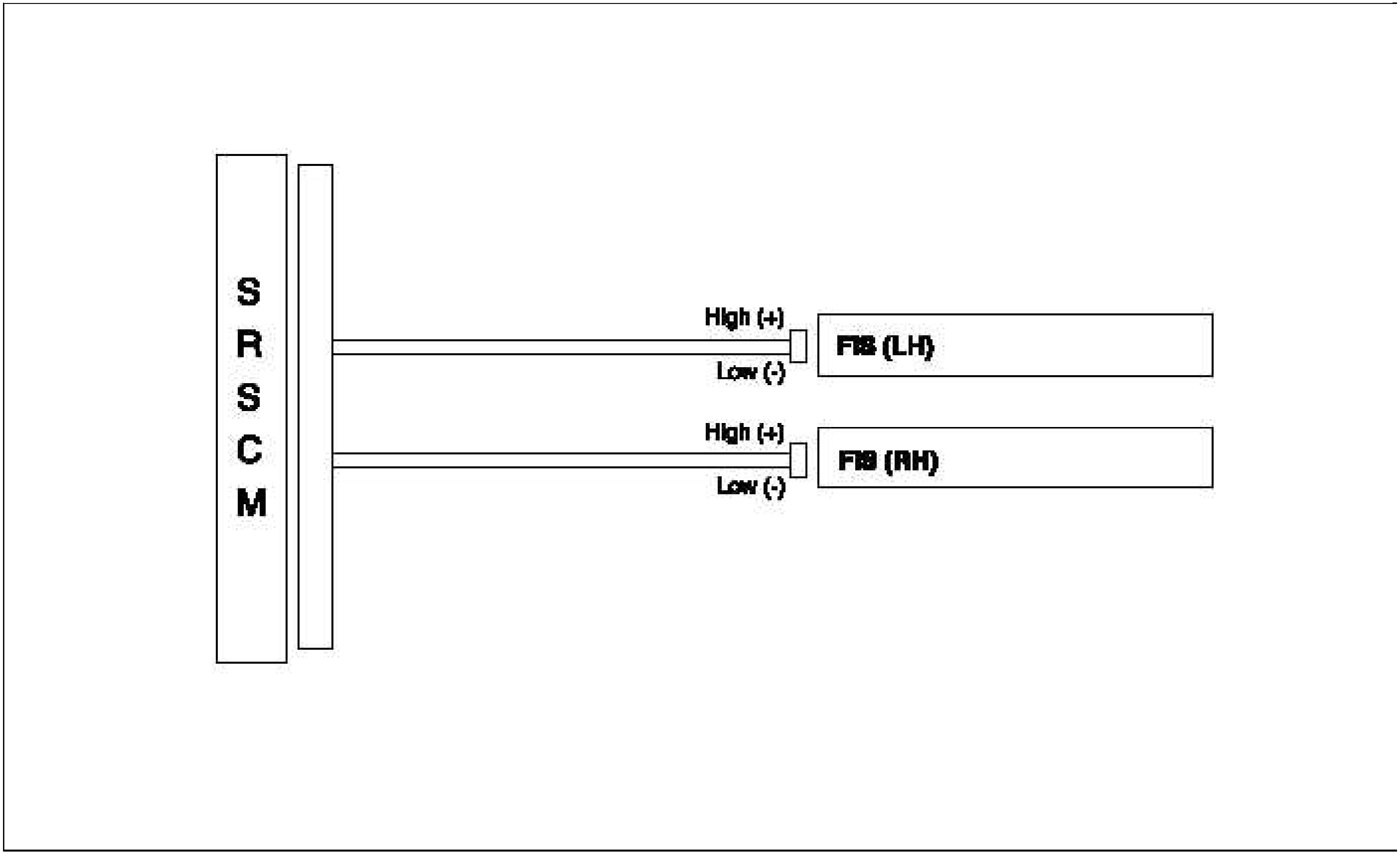
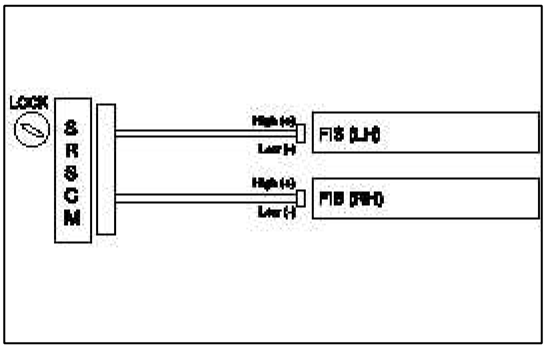

S
R
S
C
M
High (+)
Low (-)
FIS (LH)
High (+)
Low (-)
FIS (RH)

INSPECTION PROCEDURE

1. Preparation
   - A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   - B. Remove the DAB module.
   - C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   - D. Disconnect the connector of theSRSCM.

> **CAUTION**
>
> Place the DAB with the front surface facing upward.

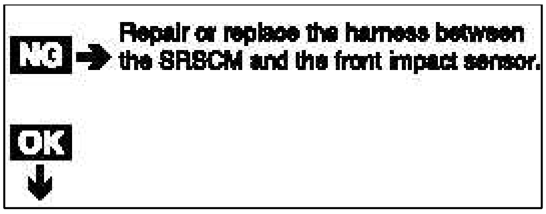
2. Check the front impact sensor circuits (Communication error).


LOCK
S
R
S
C
M
High (+)
Low (-)
FIS (LH)
High (+)
Low (-)
FIS (RH)

[PREPARATION]

Check sensor continuity between sensor SRSCM connector and both front impact sensor connector's high (+) and low (-) sides.

OK : Continuity

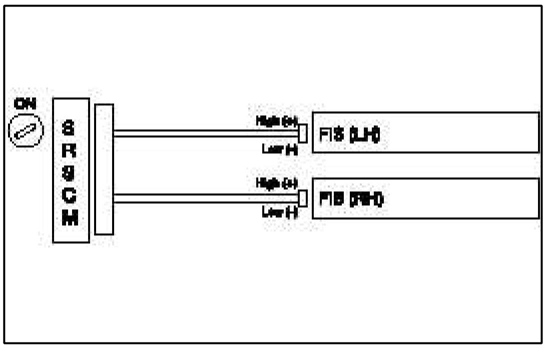


NG ➔ Repair or replace the harness between the SRSCM and the front impact sensor.

OK

↓

3. Check the front impact sensor (Defect).
   - A. Turn the ignition switch to LOCK.
   - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   - C. Connect the front impact sensor connector.
   - D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

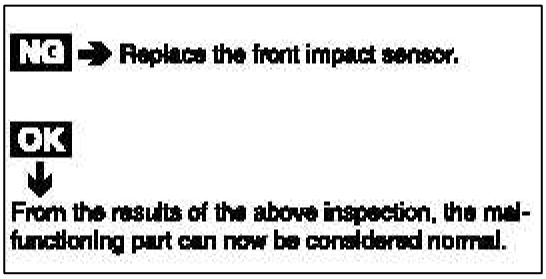


   - A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   - B. Clear the malfunction code stored in the memory of the Hi-Scan Pro.
   - C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   - D. Turn the ignition switch to ON, and wait for 30 seconds.
   - E. Using the Hi-Scan Pro, check for DTCs.

     There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.



NG ➔ Replace the front impact sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1346

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1346 DAB resistance too high (R ≥ 6.0Ω) B1347 DAB resistance too low (R ≤ 0.9Ω) B1481 2nd stage DAB resistance too high (R ≥ 6.0Ω) B1482 2nd stage DAB resistance too low (R ≤ 0.9Ω)

CIRCUIT DESCRIPTION

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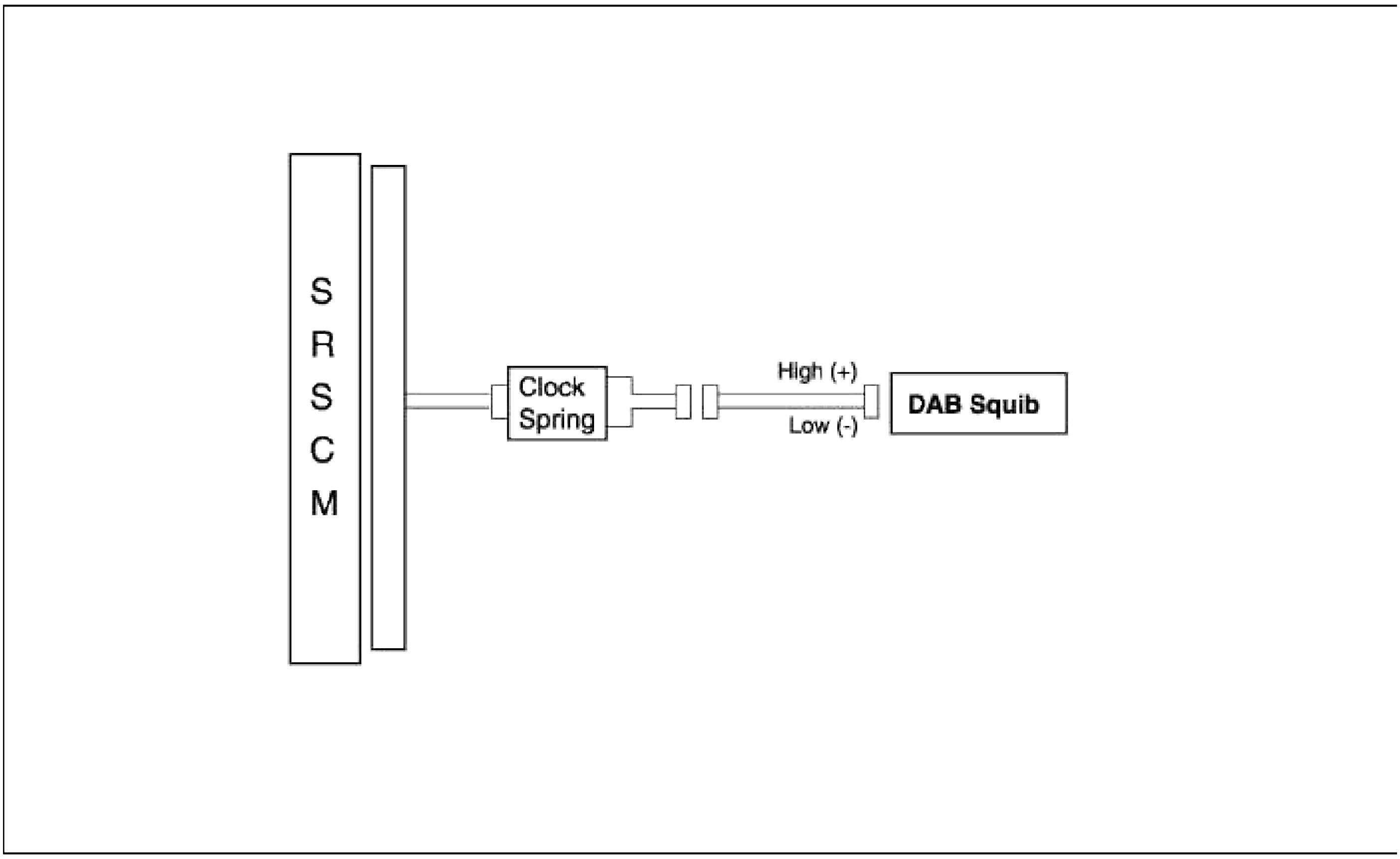
DTC Detecting Condition	Trouble Area
• Too high or low resistane between DAB high (+) wiring harness and DAB low (-) wiring harness of squib. • DAB malfunction • Clock spring malfunction • SRSCM malfunction	• 1st stage DAB squib • Clock spring • SRSCM • Wire harness • 2nd stage DAB squib

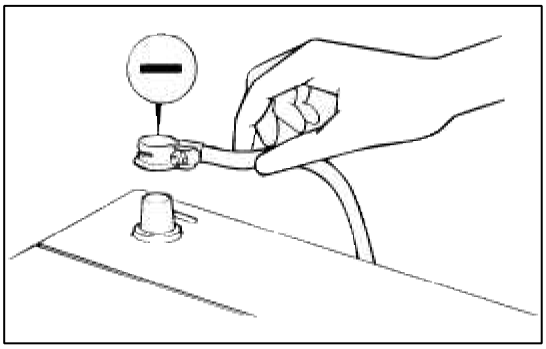
WIRING DIAGRAM



INSPECTION PROCEDURE

1. Preparation
   A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   B. Remove the DAB module.
   C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.

D. Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

2. Check the DAB resistance.

[PREPARATION]

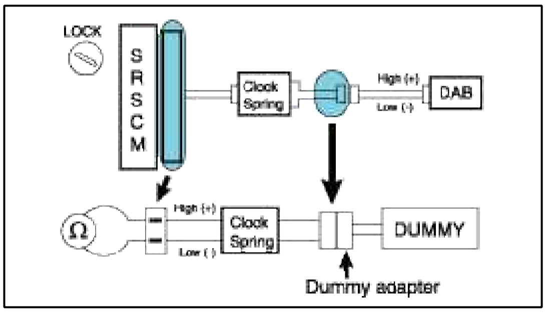
Release the airbag activation prevention mechanism on SRSCM side of airbag squib side. Connect the dummy (0957A-38200) and dummy adapter (0957A-1C000) to the clock spring side connector.

WARNING

Never attempt to measure the circuit resistance of the airbag module (squib) even if you are using the specified tester.

NOTE

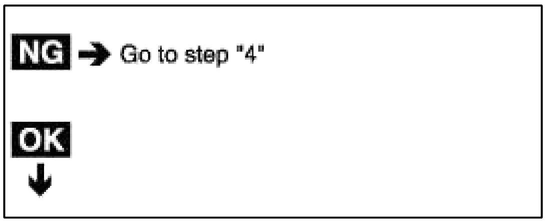
Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.


LOCK
SRSCM
Clock Spring
High (+)
Low (-)
DAB
Ω
High (+)
Low (-)
Clock Spring
DUMMY
Dummy adapter

[CHECK]

Measure the resistance between the DAB high (+) and low (-).

1.6Ω ≤ R ≤ 4.1Ω



NG → Go to step "4"

OK ↓

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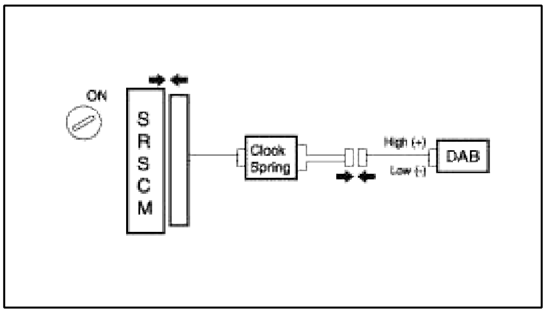
3. Check the DAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the DAB connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.



   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using Hi-Scan Pro, check the DTC.

   There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.

NG → Replace the DAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

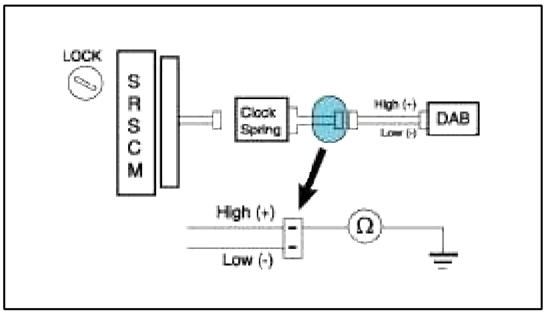
4. Check the clock spring.

[PREPARAION]

Disconnect the connector between the SRSCM clock spring, to the clock spring side connector.

WARNING

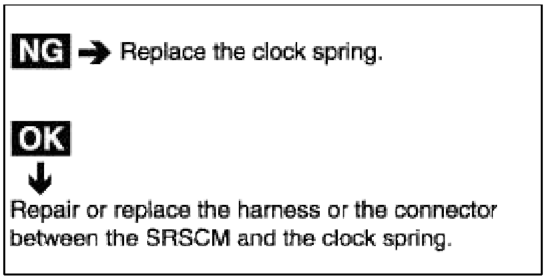
Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.



[CHECK]

Measure the resistance between the DAB high (+) and low (-).

$1.6\Omega \le R \le 4.1\Omega$



NG → Replace the clock spring.

OK

↓

Repair or replace the harness or the connector between the SRSCM and the clock spring.

Restraint > Troubleshooting > B1348

CIRCUIT INSPECTION (SRE-LC)

DTC	B1348 DAB Short to ground B1354 PAB Short to ground B1363 DBPT Short to ground B1369 PBPT Short to ground B1380 DSAB Short to ground B1384 PSAB Short to ground B1401 Satellite sensor left side short to ground B1404 Satellite sensor right side short to ground

CIRCUIT DESCRIPTION

DTC Detecting Condition	Trouble Area
• Short circuit in squib wire harness (to ground) • Squib malfunction • Clock spring malfunction • SRSCM malfunction	• DAB squib • PAB squib • DSAB squib • PSAB squib • BPT squib • Satellite sensor • Clock spring • SRSCM • Wire harness

WIRING DIAGRAM

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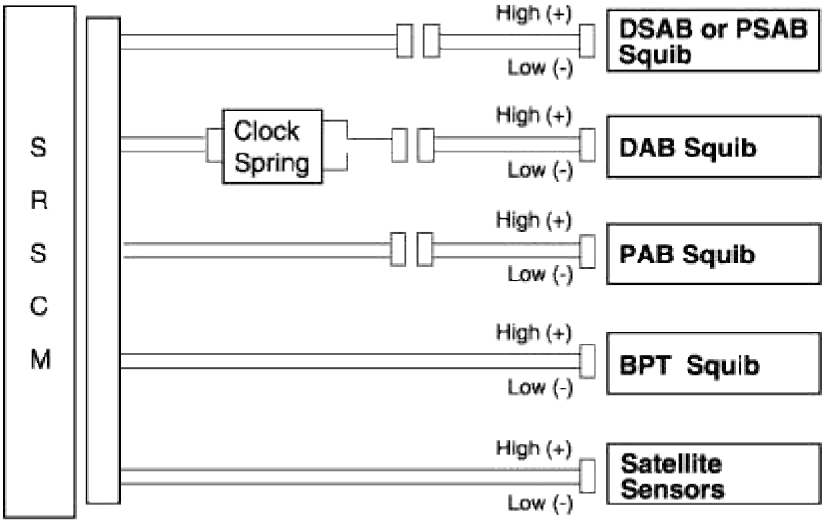
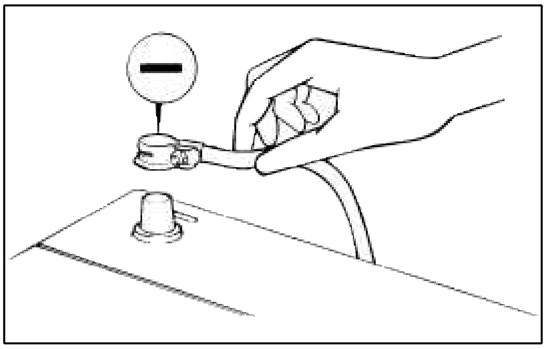

S
R
S
C
M
Clock Spring
High (+)
Low (-)
DSAB or PSAB Squib
DAB Squib
PAB Squib
BPT Squib
Satellite Sensors

INSPECTION PROCEDURE

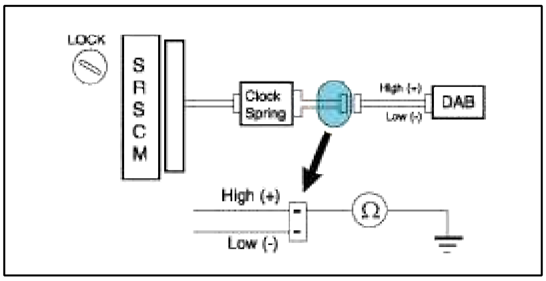
1. Preparation
   A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   B. Remove the DAB module.
   C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   D. Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

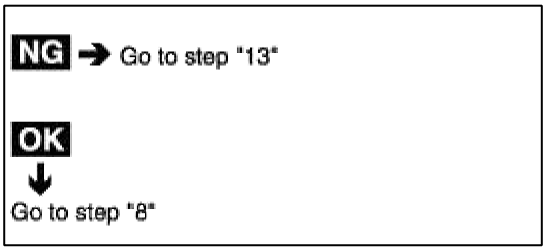
2. Check the DAB squib circuit.


LOCK
S R S C M
Clock Spring
High (+)
Low (-)
DAB
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the clock spring side) between the clock spring and the DAB, measure the resistance between the DAB high and body ground.

Resistance: ∞



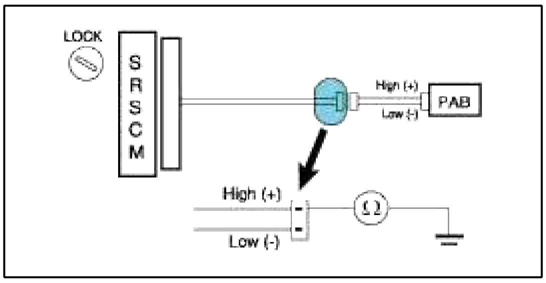
NG ➔ Go to step "13"

OK

↓

Go to step "8"

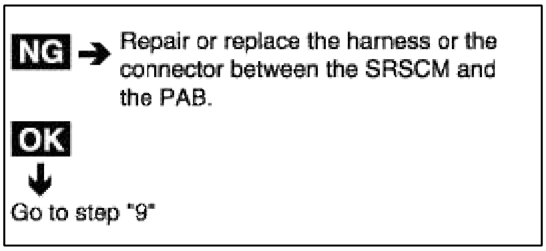
3. Check the PAB squib circuit.


LOCK
S R S C M
High (+)
Low (-)
PAB
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the PAB, measure the resistance between the PAB high and body ground.

Resistance: ∞



NG ➔ Repair or replace the harness or the connector between the SRSCM and the PAB.

OK

↓

Go to step "9"

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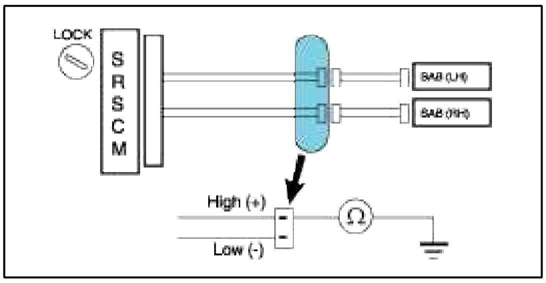
4. Check the PSAB and DSAB squib circuit.


LOCK
SRSCM
SAB (LH)
SAB (RH)
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the SAB, measure the resistance between the SAB high and body ground.

Resistance: ∞

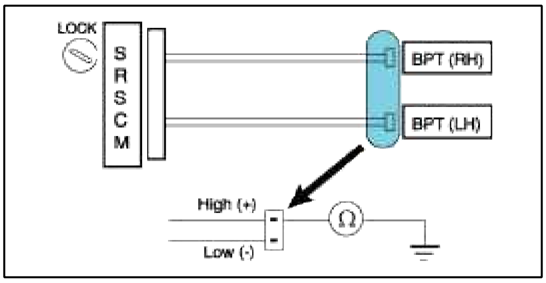
NG ➔ Repair or replace the harness between the SRSCM and the SAB.

OK

↓

Go to step "10"

5. Check the BPT squib circuit.


LOCK
SRSCM
BPT (RH)
BPT (LH)
High (+)
Low (-)
Ω

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the BPT, measure the resistance between the BPT high and body ground.

Resistance: ∞

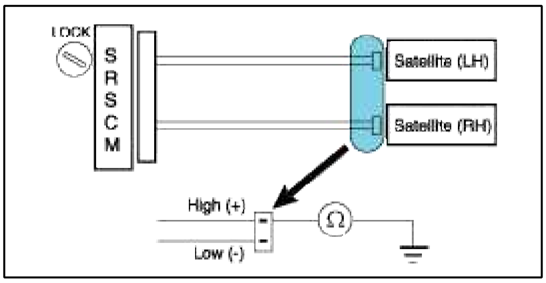
NG ➔ Repair or replace the harness between the SRSCM and the BPT.

OK

↓

Go to step "11"

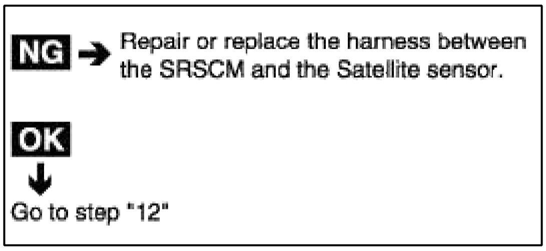
6. Check the Satellite sensor circuit.



[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the Satellite sensor, measure the resistance between the Satellite high and body ground.

Resistance: ∞



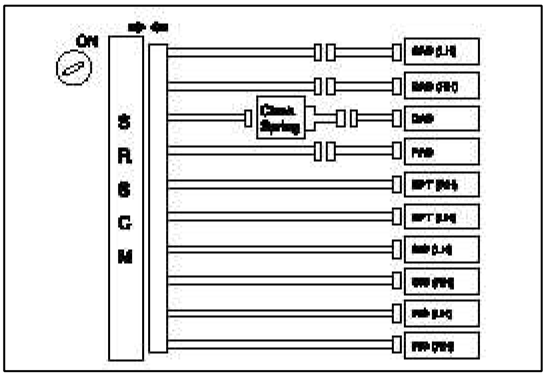
NG → Repair or replace the harness between the SRSCM and the Satellite sensor.

OK

↓

Go to step "12"

7. Check the SRSCM.
   - A. Connect the connector to the SRSCM.
   - B. Using a service wire, connect the DAB high and the DAB low to the clock spring side connector between the clock spring and the DAB.
   - C. Using a service wire, connect the PAB high and low on the SRSCM side of the connector between the SRSCM and the PAB.
   - D. Connect the SAB and the BPT by the same method.
   - E. Connect the negative (-) terminal cable to the battery, and wait least 30 seconds.



   - A. Turn the ignition switch to ON, and wait at least 30 seconds.
   - B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   - C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   - D. Turn the ignition switch to ON, and wait for 30 seconds.
   - E. Using Hi-Sacn Pro, check the DTC.

     There is no DTC.

[HINT]

Codes other than these ones may be output at this time, but they are not relevantto this check.

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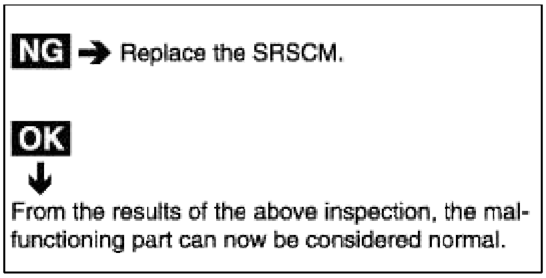
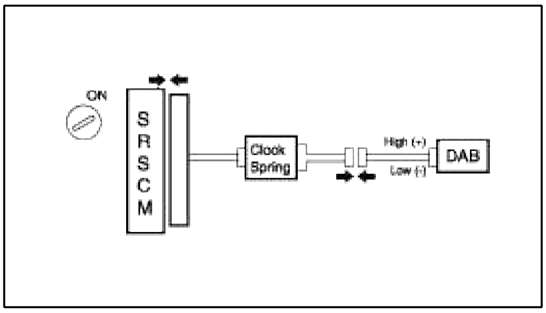


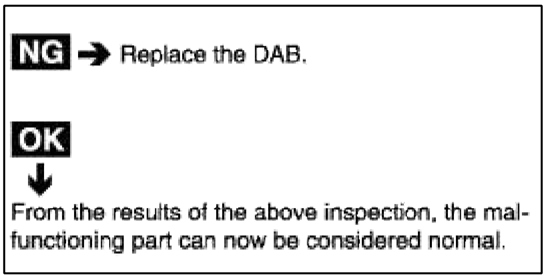
NG → Replace the SRSCM.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

8. Check the DAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the the DAB connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.



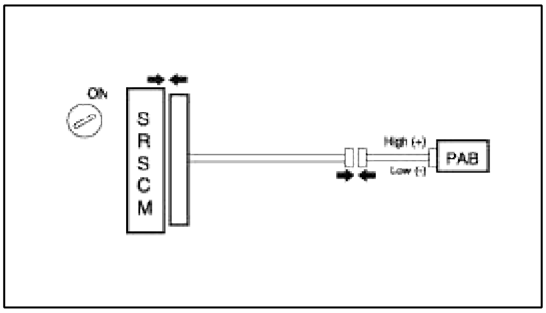
   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using the Hi-scan, check the DTC.
   There is no DTC.



NG → Replace the DAB.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

9. Check the PAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the the PAB connector.
   D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.

E. Using the Hi-Sacn Pro, check the DTC.

There is no DTC.

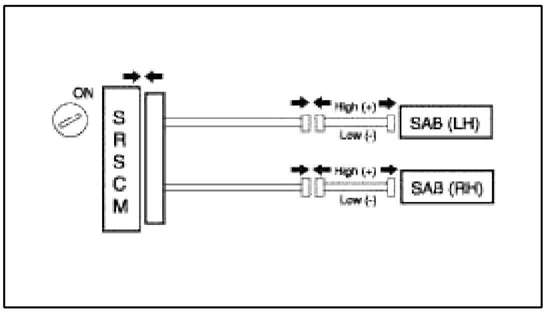
[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.

NG → Replace the PAB.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

10. Check the SAB squib.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the the SAB connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



A. Turn the ignition switch to ON, and wait for at least 30 seconds.
B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch ON, and wait for 30 seconds.
E. Using the Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.

NG → Replace the SAB.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

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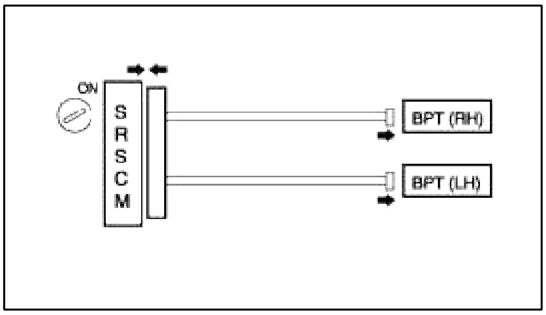
11. Check the BPT squib.
    A. Turn the ignition swich to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the BPT connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

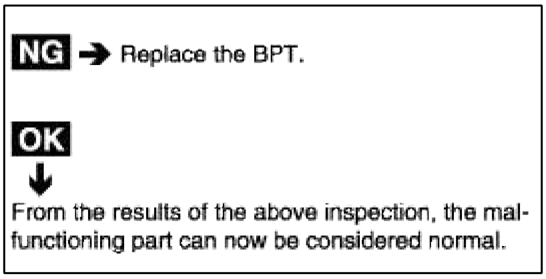


A. Turn the ignition switch to ON, and wait for 30 seconds.
B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch to ON, and wait for 30 seconds.
E. Using the Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the BPT.

OK

↓

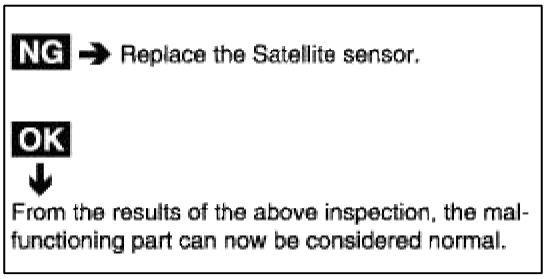
From the results of the above inspection, the malfunctioning part can now be considered normal.

12. Check the Satellite sensors.
    A. Turn ignition switch to LOCK.
    B. Disconnect negative (-) terminal cable from the battery, and wait at least 30 seconds.
    C. Connect the Satellite sensor connector.
    D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    A. Turn the ignition switch to ON, and wait at least 30 seconds.
    B. Clear the malfunction code stored in memory with the Hi-Scan Pro.
    C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
    D. Turn the ignition switch to ON, and wait at least 30 seconds.
    E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



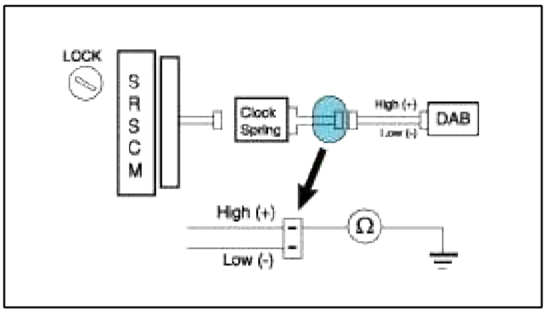
NG → Replace the Satellite sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

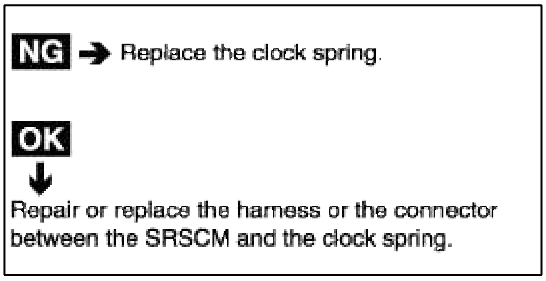
13. Check the clock spring circuit.



[CHECK]

Measure the resistance between the DAB high on the clock spring side of the connector between the clock spring and the DAB and body ground.

Resistance: ∞



NG → Replace the clock spring.

OK

↓

Repair or replace the harness or the connector between the SRSCM and the clock spring.

Restraint > Troubleshooting > B1349

CIRCUIT INSPECTION (SRE-LC)

DTC	B1349 DAB Short to battery B1355 PAB Short to battery B1364 BPT (Driver) Short to battery B1370 BPT (Passenger) Short to battery B1381 SAB (Driver) short to battery B1385 SAB (Passenger) short to battery B1402 Satellite left side short to battery B1405 Satellite right side short to battery

CIRCUIT DESCRIPTION

DTC Detecting Condition	Trouble Area
• Short circuit in squib wire harness (to B+) • Squib malfunction • Spiral cable malfunction • SRSCM malfunction	• DAB squib • PAB squib • DSAB or PSAB squib • BPT squib • Satellite sensor • Wire harness

WIRING DIAGRAM

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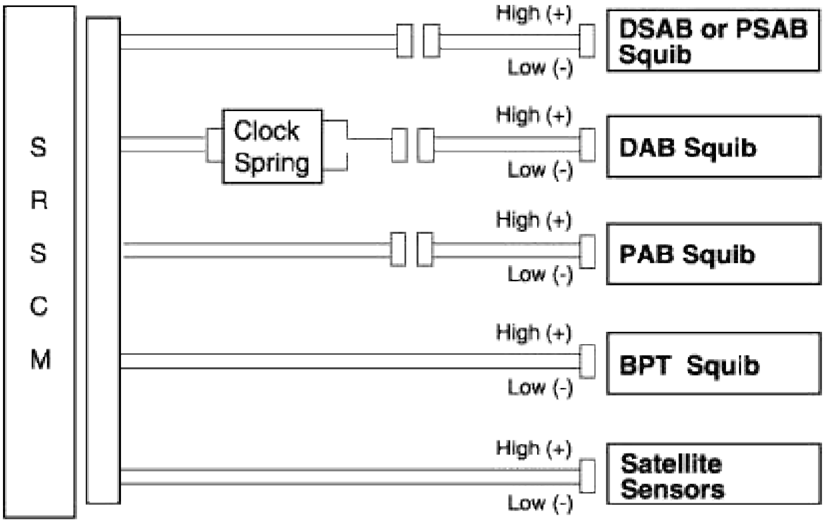
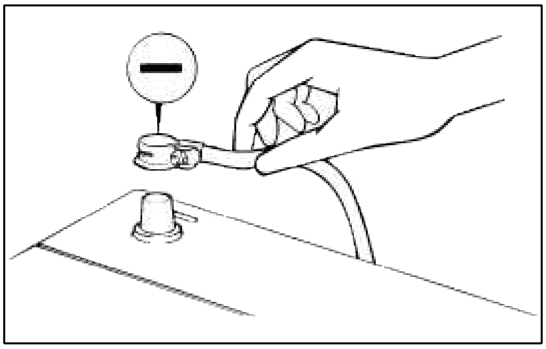

S
R
S
C
M
Clock
Spring
High (+)
Low (-)
DSAB or PSAB Squib
DAB Squib
PAB Squib
BPT Squib
Satellite Sensors

INSPECTION PROCEDURE

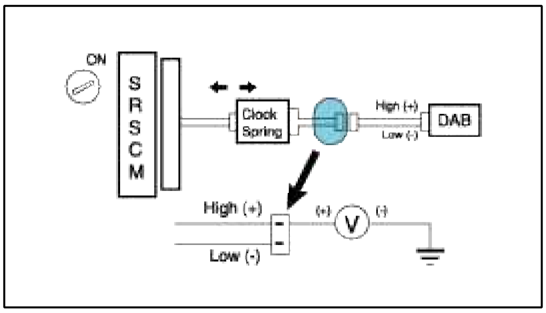
1. Preparation
   A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   B. Remove the DAB module.
   C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   D. Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

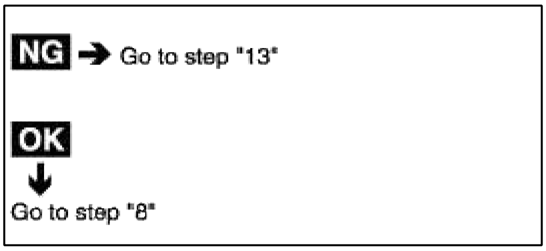
2. Check the DAB squib circuit.


ON
SRSCM
Clock Spring
High (+)
Low (-)
DAB
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector (on the clock spring side) between the clock spring and the DAB, measure the voltage between the DAB high and body ground.

Voltage : 0 V



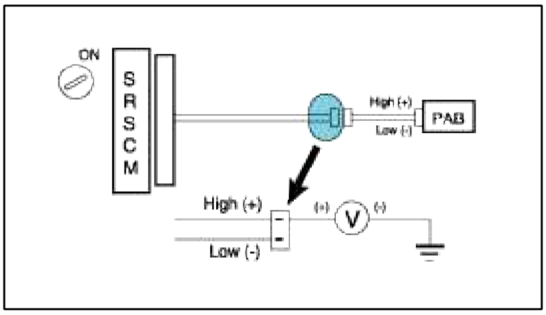
NG ➔ Go to step "13"

OK

↓

Go to step "8"

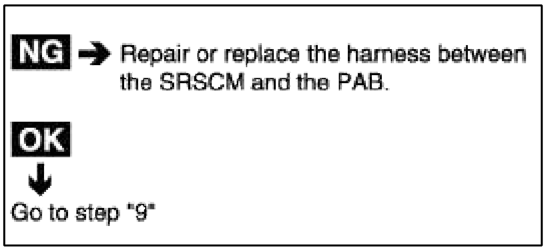
3. Check the PAB squib circuit.


ON
SRSCM
High (+)
Low (-)
PAB
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the PAB, measure the voltage between the PAB high and body ground.

Voltage : 0 V



NG ➔ Repair or replace the harness between the SRSCM and the PAB.

OK

↓

Go to step "9"

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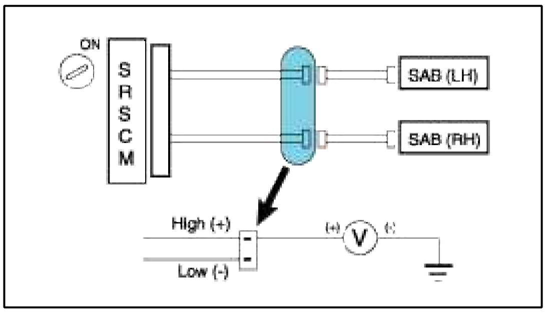
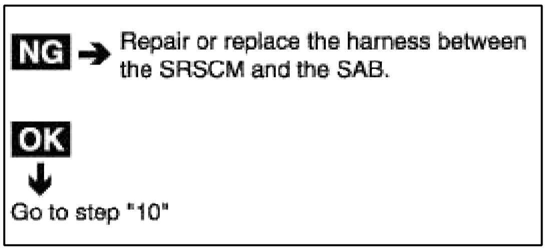
4. Check the SAB squib circuit.


ON
SRSCM
SAB (LH)
SAB (RH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector (on the SRSCM side) between the SRSCM and the SAB, measure the voltage between the SAB high and body ground.

Voltage : 0 V



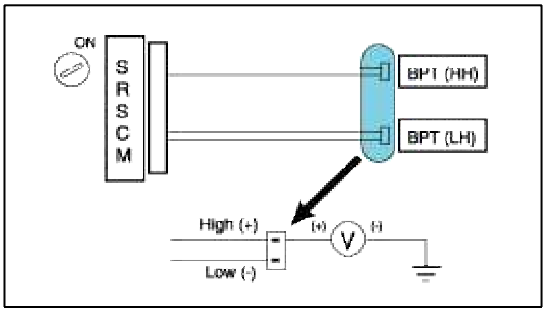
NG ➔ Repair or replace the harness between the SRSCM and the SAB.

OK

🡇

Go to step "10"

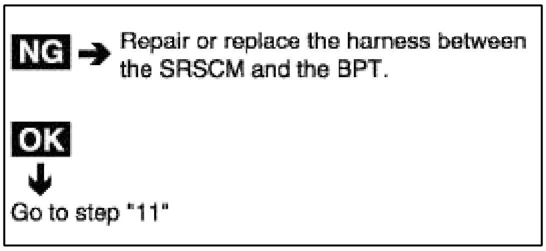
5. Check the BPT squib circuit.


ON
SRSCM
BPT (RH)
BPT (LH)
High (+)
Low (-)
(+)
V
(-)

[CHECK]

For the connector between the SRSCM and the BPT, measure the voltage between the BPT high and body ground.

Voltage : 0 V



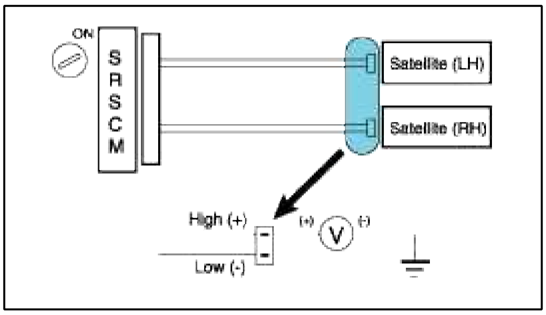
NG ➔ Repair or replace the harness between the SRSCM and the BPT.

OK

🡇

Go to step "11"

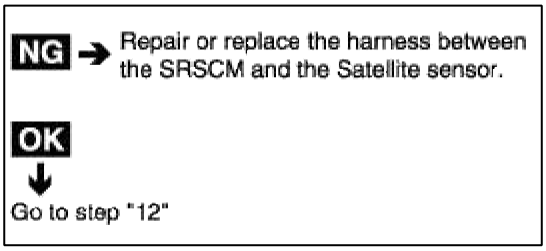
6. Check the Satellite sensor circuit.



[CHECK]

For the connector between the SRSCM and the Satellite sensor, measure the voltage between the Satellite sensor high and body ground.

Voltage : 0 V



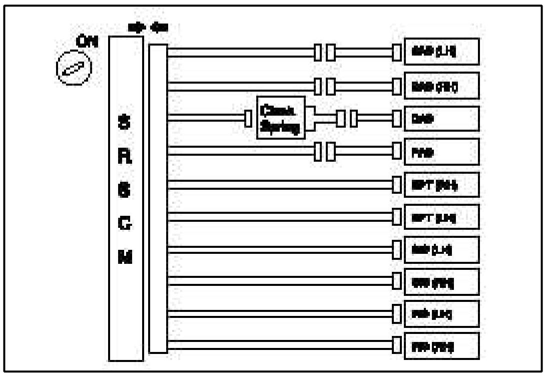
NG ➔ Repair or replace the harness between the SRSCM and the Satellite sensor.

OK

↓

Go to step "12"

7. Check the SRSCM.



A. Connect the connector to the SRSCM.
B. Using a service wire, connect the DAB high and low on the clock spring side of the connector between the clock spring and the DAB.
C. Using a service wire, connect the PAB high and low on the SRSCM side of the connector between the SRSCM and the PAB.
D. Using a service wire, connect the SAB high and low on the SRSCM side connector between the SRSCM and the SAB.
E. Using a service wire, connect the BPT high and low on the SRSCM side connector between the SRSCM and the BPT.
F. Using a service wire, connect the satellite high and low on the SRSCM side connector between the SRSCM and the satellite sensor.
G. Connect negative (-) battery cable to the battery, and wait at least 30 seconds.
A. Turn the ignition switch to ON, and wait at least 30 seconds.
B. Clear the malfunction code stored in memory with Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
D. Turn the ignition switch to ON, and wait at least 30 seconds.
E. Using Hi-Scan Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.

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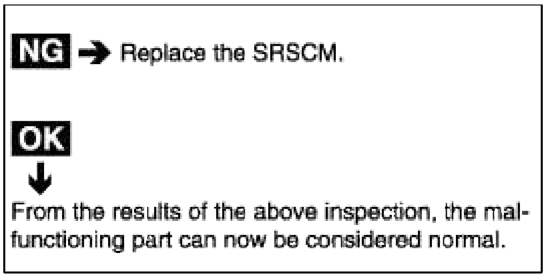


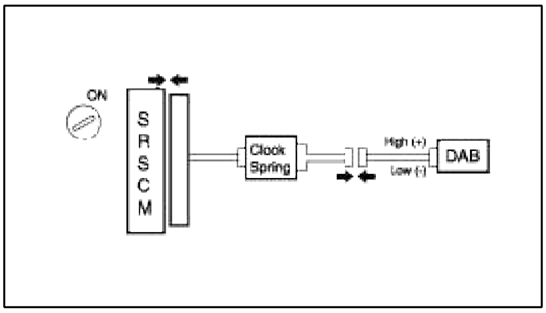
NG → Replace the SRSCM.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

8. Check the DAB squib.
   - A. Turn the ignition switch to LOCK.
   - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   - C. Connect the DAB connector.
   - D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

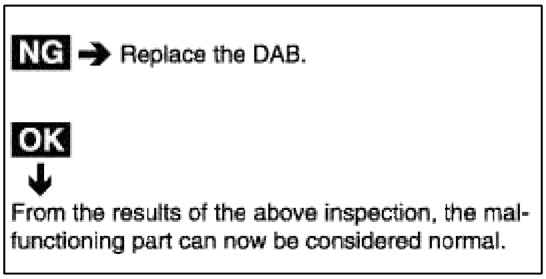


- A. Turn the ignition switch to ON, and wait for at least 30 seconds.
- B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
- C. Turn the ignition switch to LOCK, and wait for 30 seconds.
- D. Turn the ignition switch to ON, and wait for 30 seconds.
- E. Using Hi-Scan Pro, check the DTC.

  There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the DAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

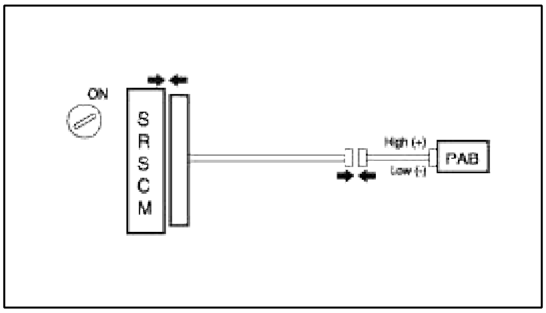
9. Check the PAB squib.

A. Turn the ignition switch to LOCK.

B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.

C. Connect the the PAB connector.

D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



A. Turn the ignition switch to ON, and wait for at least 30 seconds.

B. Clear the malfunction code stored in the memory with Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait for 30 seconds.

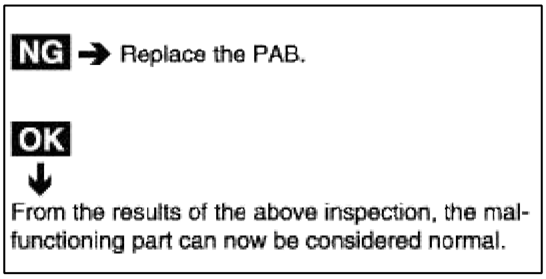
D. Turn the ignition switch ON, and wait for 30 seconds.

E. Using the Hi-Sacn Pro, check the DTC.

DTC is not output.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the PAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

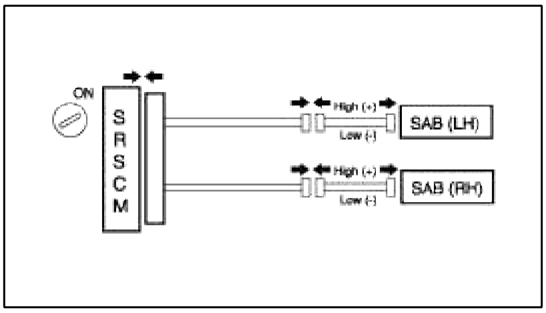
10. Check the SAB squib.

A. Turn the ignition switch to LOCK.

B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.

C. Connect the SAB connector.

D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.



A. Turn the ignition switch to ON, and wait for at least 30 seconds.

B. Clear the malfunction code stored in the memory with Hi-Scan Pro.

C. Turn the ignition switch to LOCK, and wait for 30 seconds.

D. Turn the ignition switch ON, and wait for 30 seconds.

E. Using the Hi-Sacn Pro, check the DTC.

There is no DTC.

[HINT]

Codes other than these ones may be output at this time, but they are not relevant to this checking procedure.

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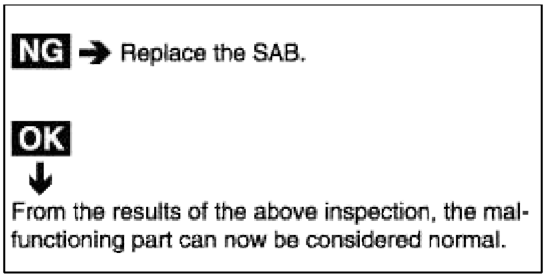
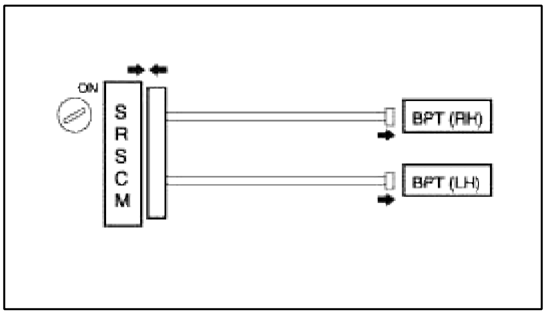


NG → Replace the SAB.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

11. Check the BPT squib.
    A. Turn the ignition swich to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
    C. Connect the the BPT connector.
    D. Connect the negative (-) terminal cable from the battery, and wait for 30 seconds.

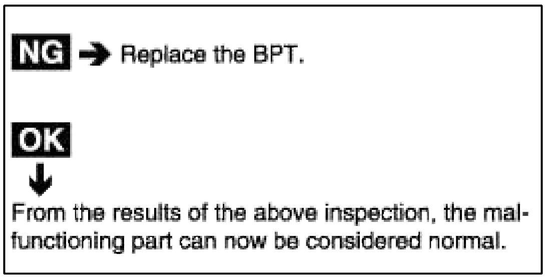


A. Turn the ignition switch to ON, and wait for 30 seconds.
B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch to ON, and wait for 30 seconds.
E. Using the Hi-Scan Pro check the DTC.

There is no DTC.

[HINT]

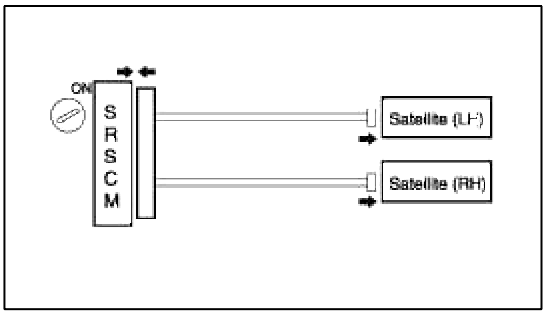
Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the BPT.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

12. Check the Satellite sensors.
    A. Turn ignition switch to LOCK.
    B. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
    C. Connect the Satellite sensor connector.
    D. Connect the negative (-) terminal cable from the battery, and wait at least 30 seconds.

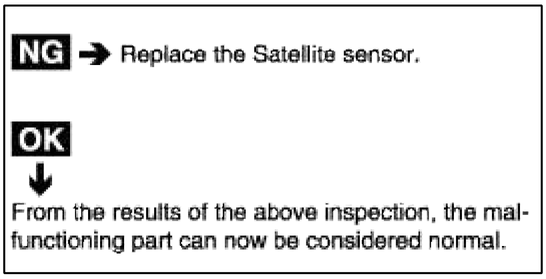


    A. Turn the ignition switch to ON, and wait at least 30 seconds.
    B. Clear the malfunction code stored in memory with Hi-scan Pro.
    C. Turn the ignition switch to LOCK, and wait at least 30 seconds.
    D. Turn the ignition switch to ON, and wait at least 30 seconds.
    E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.

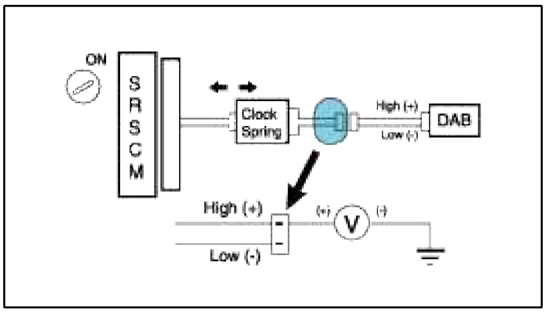


NG ➔ Replace the Satellite sensor.

OK

From the results of the above inspection, the malfunctioning part can now be considered normal.

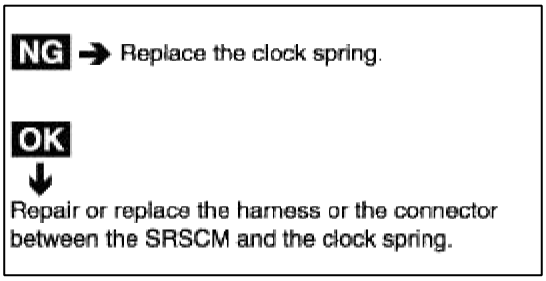
13. Check the clock spring.
    A. Turn the ignition switch to LOCK.
    B. Disconnect the connector between the SRSCM and the clock spring.



[CHECK]

Turn the ignition switch to ON, and measure voltage between the DAB high and body ground.

Voltage : 0 V



NG ➔ Replace the clock spring.

OK

Repair or replace the harness or the connector between the SRSCM and the clock spring.

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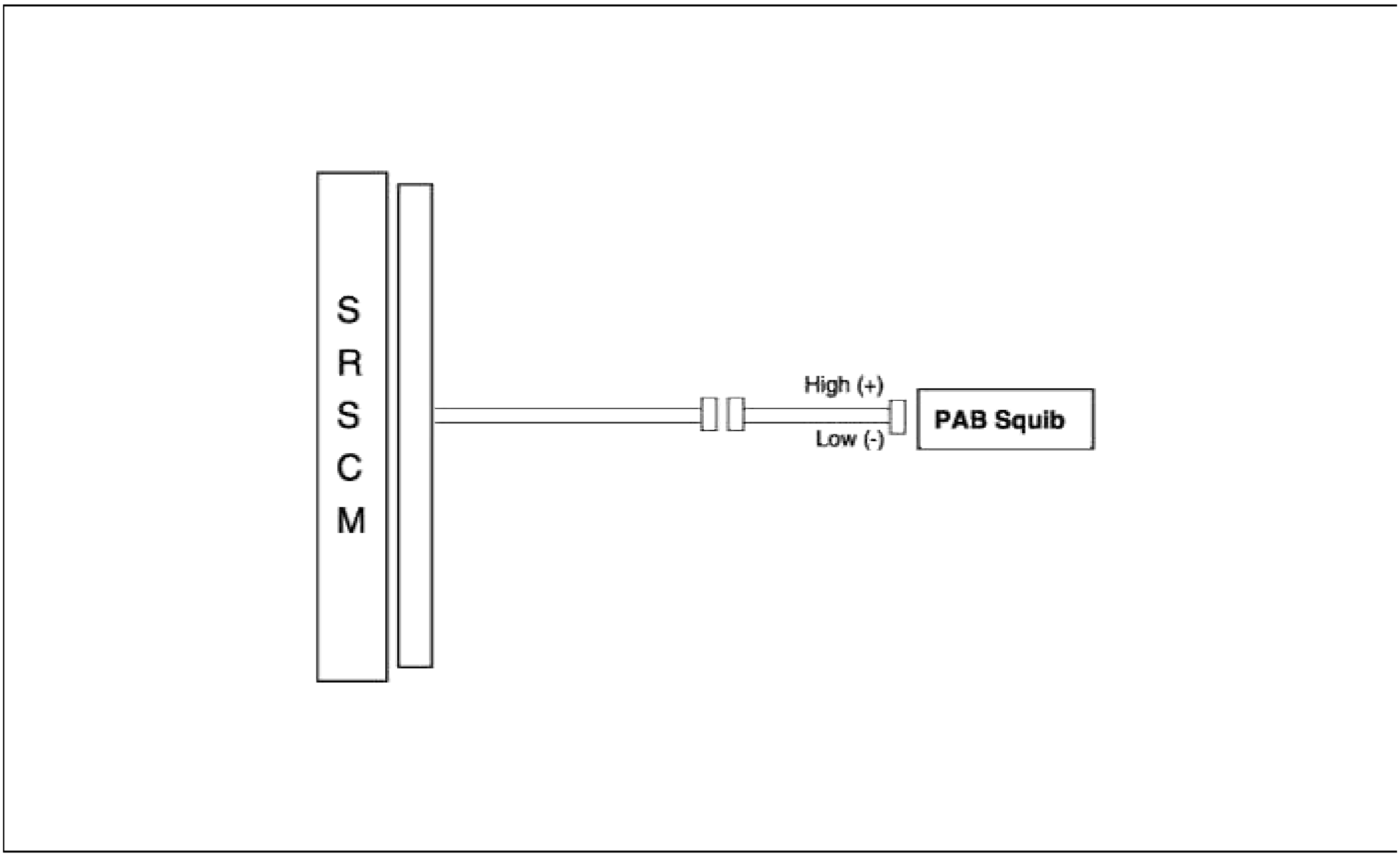
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1352 1st stage PAB resistance too high (R ≥ 4.2Ω) B1353 1st stage PAB resistance too low (R ≤ 1.0Ω) B1485 2nd stage PAB resistance too high (R ≥ 4.2Ω) B1486 2nd stage PAB resistance too low (R ≤ 1.0Ω)

CIRCUIT DESCRIPTION

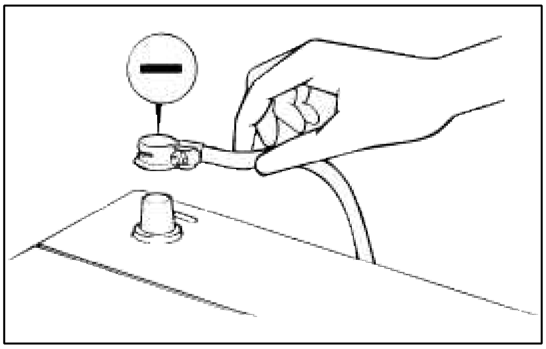
DTC Detecting Condition	Trouble Area
• Too high or low resistane between PAB high (+) wiring harness and PAB low (-) wiring harness of squib. • PAB malfunction • SRSCM malfunction	• 1st stage PAB squib • SRSCM • Wire harness • 2nd stage PAB squib

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Preparation
   A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   B. Remove the DAB module.
   C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   D. Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

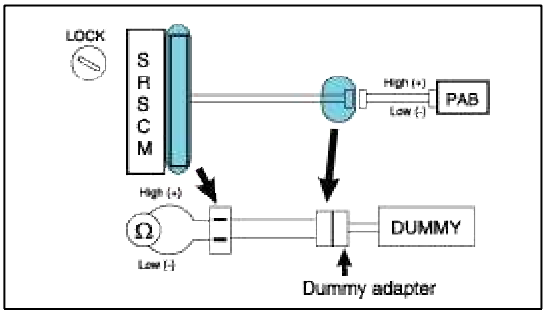
2. Check the PAB resistance.

[PREPARATION]

Release the airbag activation prevention mechanism on the SRSCM side of the airbag squib side. Connect the dummy (0957A-38200) and dummy adapter (0957A-25100) to PAB connector of the SRSCM connector side.

WARNING

Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.



[CHECK]

Measure the resistance between the PAB high (+) and the PAB low (-).

$1.8\Omega \leq R \leq 2.8\Omega$

NG → Repair or replace the harness between the SRSCM and the PAB.

OK
↓

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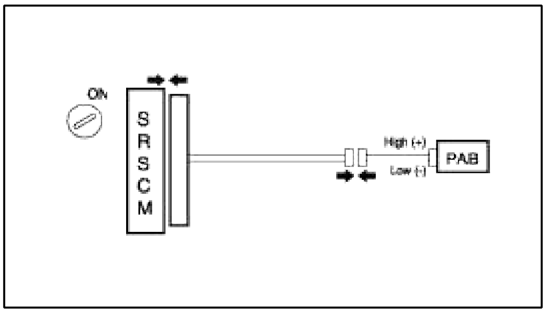
3. Check the PAB squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the PAB connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

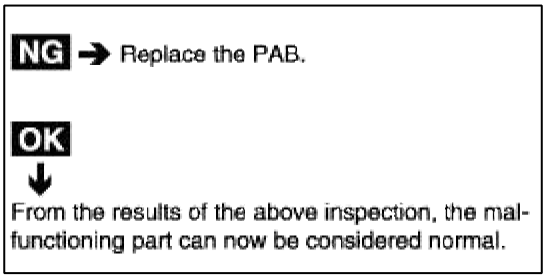


   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using Hi-Scan Pro, check the DTC.

   There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the PAB.

OK ↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1361

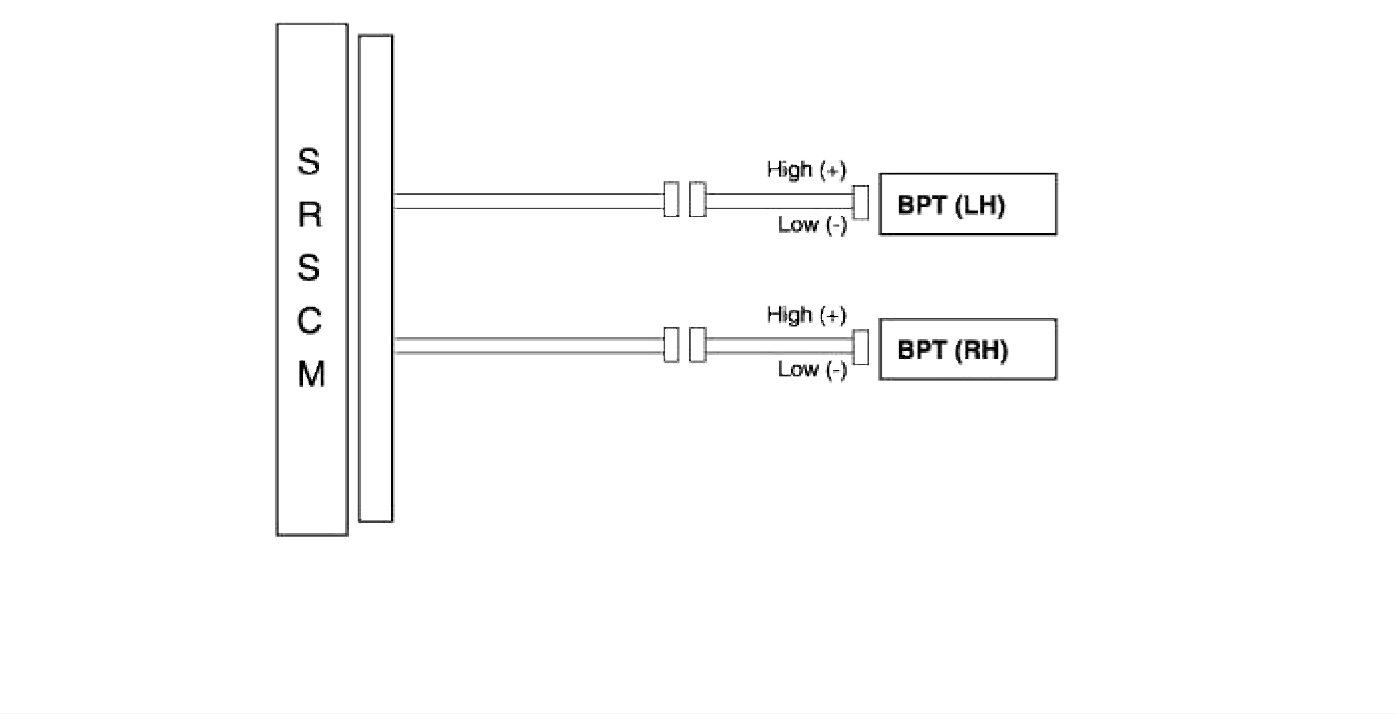
CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1361 DBPT Resistance too high (R ≥ 4.7Ω) B1362 DBPT Resistance too low (R ≤ 0.9Ω) B1367 PBPT Resistance too high (R ≥ 4.7Ω) B1368 PBPT Resistance too low (R ≤ 0.9Ω)

CIRCUIT DESCRIPTION

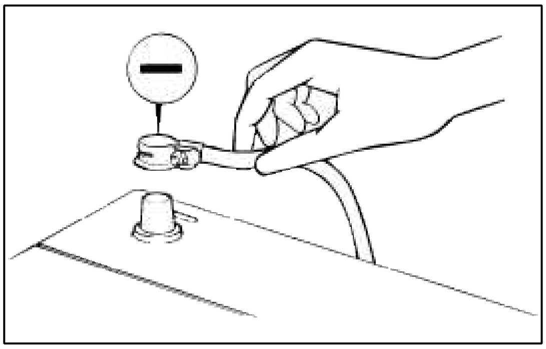
DTC Detecting Condition	Trouble Area
• Too high or low resistane between BPT high (+) wiring harness and BPT low (-) wiring harness of squib. • BPT malfunction • SRSCM malfunction	• BPT squib • SRSCM • Wire harness

WIRING DIAGRAM



INSPECTION PROCEDURE

1. Preparation
   - A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   - B. Remove the DAB module.
   - C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   - D. Disconnect the SRSCM connector.



WARNING

Place the DAB with the front surface facing upward.

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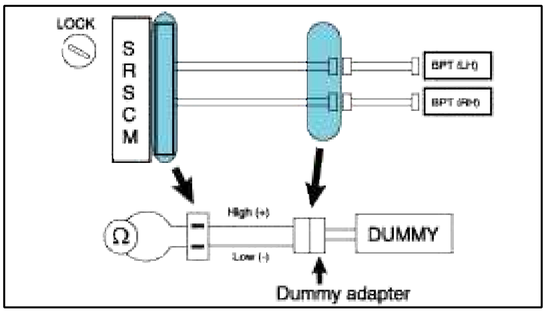
2. Check the BPT resistance.

   [PREPARATION]

   Release the airbag activation prevention mechanism on the SRSCM side of the airbag squib side. Connect the dummy (0957A-38200) and dummy adapter (0957A-1C000) to the BPT connector of the SRSCM connector side.

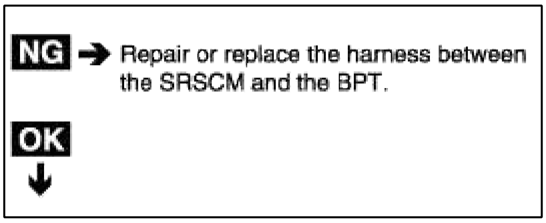
   > **NOTE**
   >
   > Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.



   [CHECK]

   Measure the resistance between the BPT high (+) and the BPT low (-).

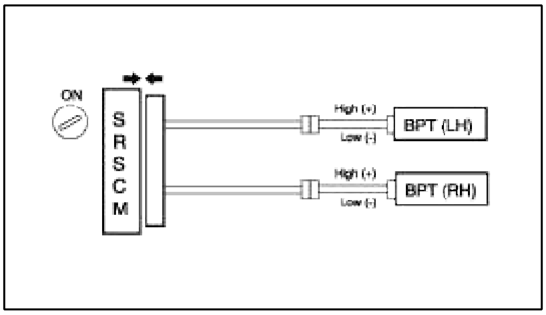
   1.8Ω ≤ R ≤ 3.1Ω



NG → Repair or replace the harness between the SRSCM and the BPT.

OK ↓

3. Check the BPT squib.
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the BPT connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

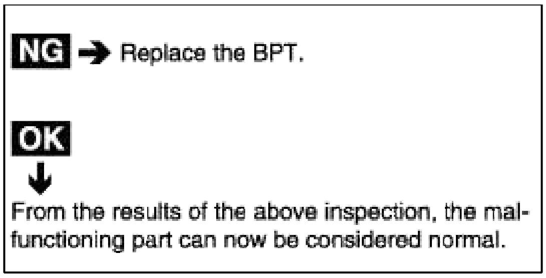


   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using Hi-Scan Pro, check the DTC.

      There is no DTC.

   [HINT]

   Codes other than these may be output at this time, but they are not relevant to this procedure.



NG → Replace the BPT.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1378

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

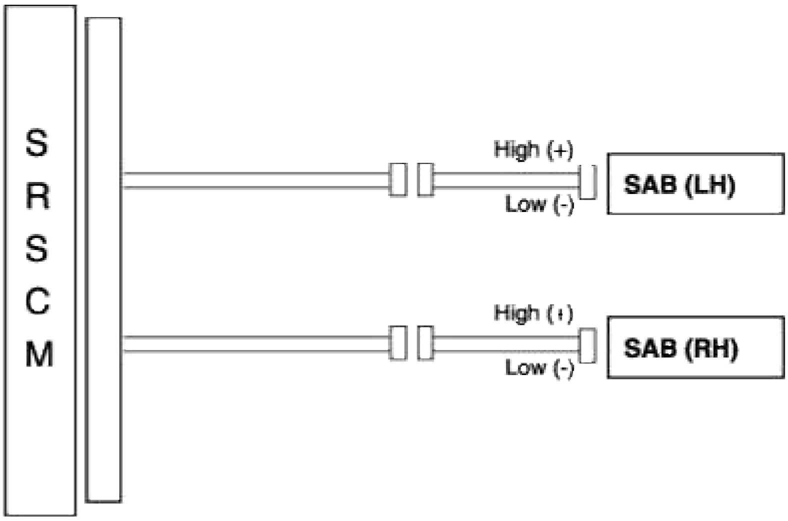
DTC	B1378 DSAB Resistance too high (R ≥ 4.2Ω) B1379 DSAB Resistance too low (R ≤ 1.0Ω) B1382 PSAB Resistance too high (R ≥ 4.2Ω) B1383 PSAB Resistance too low (R ≤ 1.0Ω)

CIRCUIT DESCRIPTION

DTC Detecting Condition	Trouble Area
• Too high or low resistane between SAB high (+) wiring harness and SAB low (-) wiring harness of squib. • SAB malfunction • SRSCM malfunction	• SAB squib • SRSCM • Wire harness

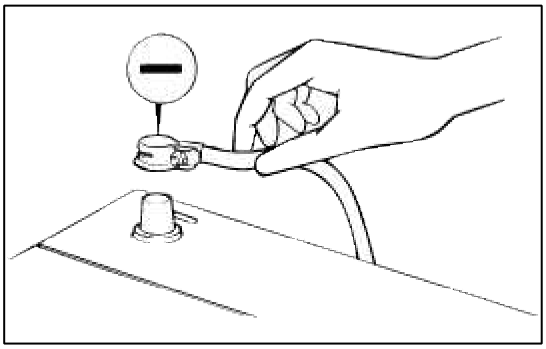
WIRING DIAGRAM

tomsn048@gmail.com



INSPECTION PROCEDURE

1. Preparation
   A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   B. Remove the DAB module.
   C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   D. Disconnect the SRSCM connector.



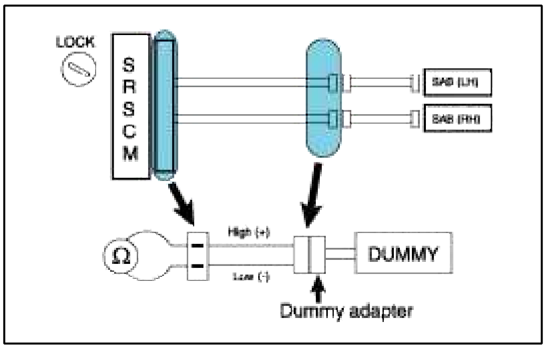
WARNING

Place the DAB with the front surface facing upward.

2. Check the SAB resistance.

[PREPARATION]

Release the airbag activation prevention mechanism on the SRSCM side of the airbag squib side. Connect the dummy (0957A-38200) and dummy adapter (0957A-38300) to the SAB connector of the SRSCM connector side.



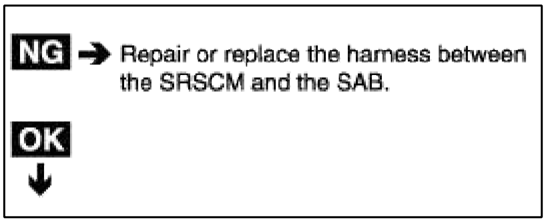
WARNING

Before checking the resistance, you have to insert the shorting bar insert plastic that is attached to the diagnosis checker into the SRSCM connector.

[CHECK]

Measure the resistance between the SAB high (+) and the SAB low (-).

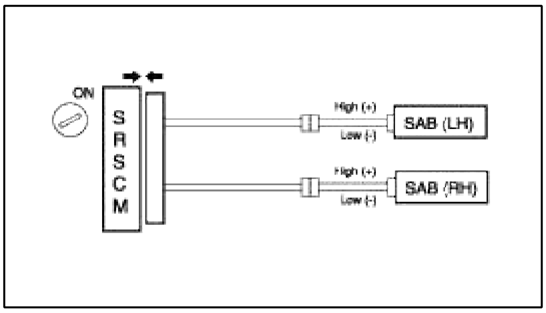
1.8Ω ≤ R ≤ 2.8Ω



NG → Repair or replace the harness between the SRSCM and the SAB.

OK ↓

3. Check the SAB squib.
   - A. Turn the ignition switch to LOCK.
   - B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   - C. Connect the SAB connector.
   - D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.



- A. Turn the ignition switch to ON, and wait for at least 30 seconds.
- B. Clear the malfunction code stored in the memory with the Hi-Scan Pro.
- C. Turn the ignition switch to LOCK, and wait for 30 seconds.
- D. Turn the ignition switch to ON, and wait for 30 seconds.
- E. Using Hi-Scan Pro, check the DTC.

  There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this procedure.

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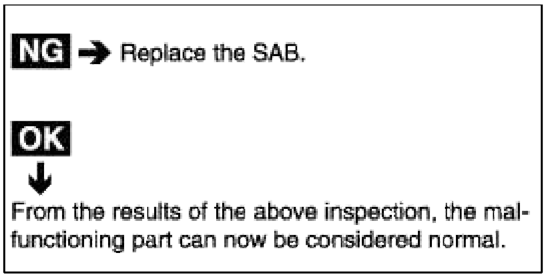


NG ➔ Replace the SAB.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1387

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1387 Driver seat track position sensor short to GND B1388 Driver seat track position sensor short to Battery B1389 Driver seat track position sensor defect B1390 Passenger seat track position sensor short to GND B1391 Passenger seat track position sensor short to Battery B1392 Passenger seat track position sensor defect

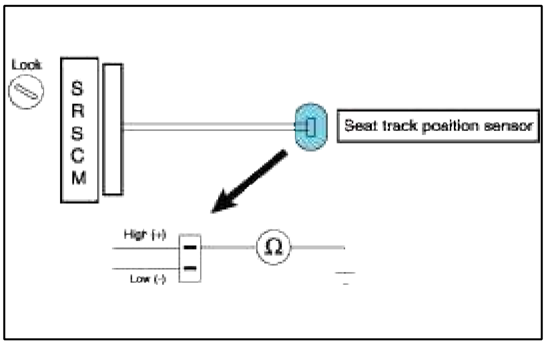
CIRCUIT DESCRIPTION

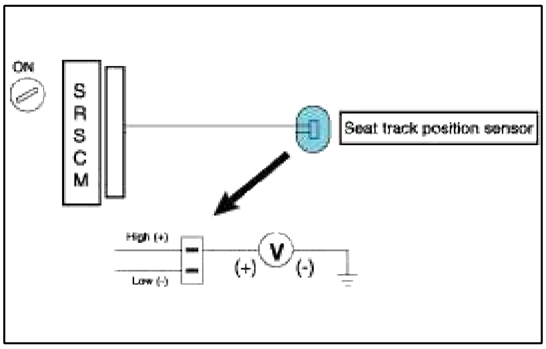
INSPECTION PROCEDURE

1. Preparation
   - A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   - B. Remove the DAB module.
   - C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   - D. Disconnect the connector of theSRSCM.

> **CAUTION**
>
> Place the DAB with the front surface facing upward.

2. Check seat track position sensor circuit (Short to GND/Battery).



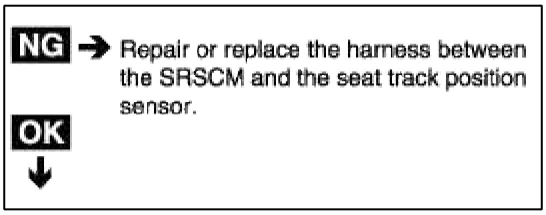


[CHECK]

Measure the voltage and resistance of the seat track position sensor high and body ground between the SRSCM connector and the seat track position sesnor connector.

Resistance : ∞

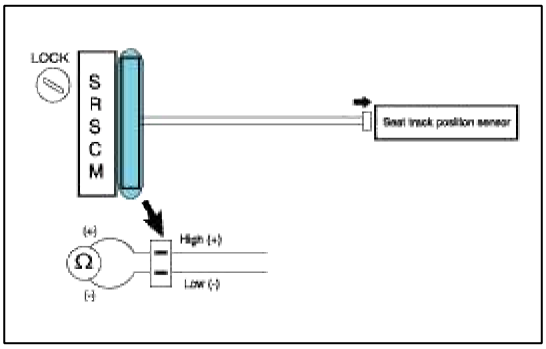
Voltage : 0 V



NG → Repair or replace the harness between the SRSCM and the seat track position sensor.

OK ↓

3. Check the seat track position sensor.

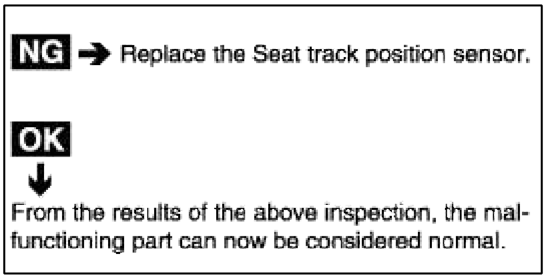

LOCK
SRSCM
Seat track position sensor
(+)
Ω
(-)
High (+)
Low (-)

[CHECK]

Check the resistance.

SWITCH OPEN : R = 900Ω ± 10% (Backward : over 5 clicks)

SWITCH CLOSED : R = 300Ω ± 10% (Forward : within 5 clicks)

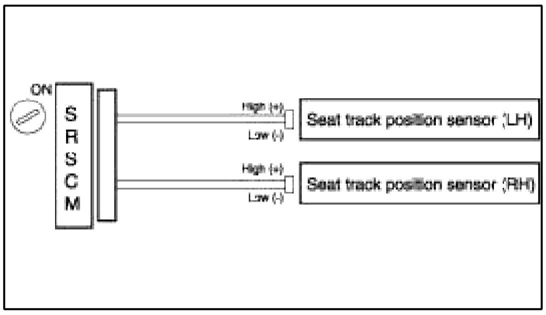


NG → Replace the Seat track position sensor.

OK ↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

4. Check the seat track position sensor. (Defect)
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the seat track position sensor connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.


ON
SRSCM
High (+)
Low (-)
Seat track position sensor (LH)
High (+)
Low (-)
Seat track position sensor (RH)

A. Turn the ignition switch to ON, and wait for at least 30 seconds.
B. Clear the malfunction code stored in the memory of the Hi-Scan Pro.
C. Turn the ignition switch to LOCK, and wait for 30 seconds.
D. Turn the ignition switch to ON, and wait for 30 seconds.
E. Using the Hi-Scan Pro, check for DTCs.

There is no DTC.

[HINT]

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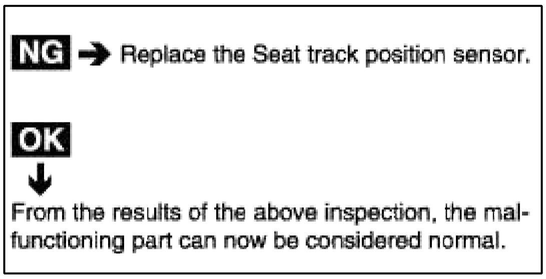
Codes other than these may be output at this time, but they are not relevant to this check.



NG → Replace the Seat track position sensor.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1395

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1395 Firing loop interconnection fault B1620 Internal fault B1650 Crash recorded (Frontal airbag) B1651 Crash recorded (Driver side airbag) B1652 Crash recorded (Passenger side airbag) B1657 Crash recorded (Belt pretensioner only) B1670 2nd stage crash recorded (Frontal airbag)

CIRCUIT DESCRIPTION

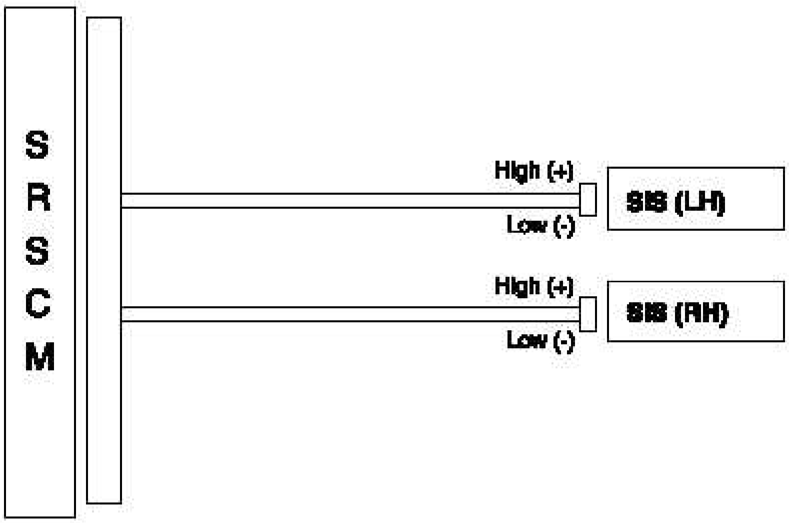
1. Condition of the firing circuit activation transistors.
2. Adequacy of deployment energy reserves.
3. Safing sensor integrity. (detection of faulty closure)
4. Plausibility of the accelerometer signal.
5. Operation of the SRSCM components.

Restraint > Troubleshooting > B1400

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1400 Side impact sensor driver side defect B1403 Side impact sensor passenger side defect B1409 Side impact sensor driver communication error B1410 Side impact sensor passenger communication error B1414 Side impact sensor driver side wrong ID B1415 Side impact sensor passenger side wrong ID

CIRCUIT DESCRIPTION
WIRING DIAGRAM

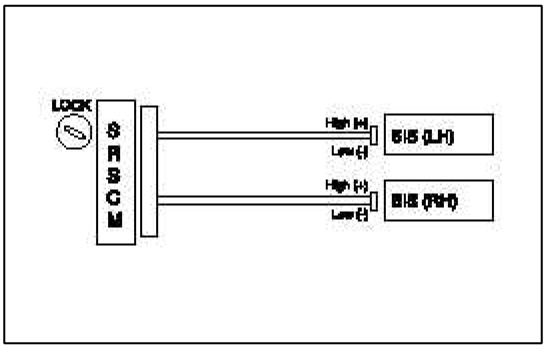

S
R
S
C
M
High (+)
Low (-)
SIS (LH)
High (+)
Low (-)
SIS (RH)

INSPECTION PROCEDURE

1. Preparation
   - A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   - B. Remove the DAB module.
   - C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   - D. Disconnect the SRSCM connector.

> **CAUTION**
>
> Place the DAB with the front surface facing upward.

2. Check side impact sensor circuits (Communication error).


LOCK
S
R
S
C
M
High (+)
Low (-)
SIS (LH)
High (+)
Low (-)
SIS (RH)

[PREPARATION]

Check side impact sensor continuity between sensor SRSCM connector and both side impact connector's high (+) and low (-) sides.

OK : Continuity

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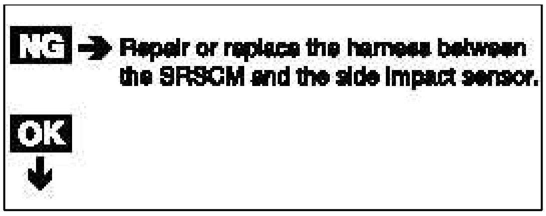
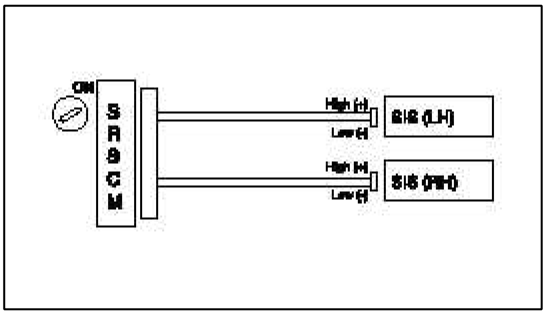


NG → Repair or replace the harness between the SRSCM and the side impact sensor.

OK

↓

3. Check the side impact sensor (Defect).
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the side impact sensor connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

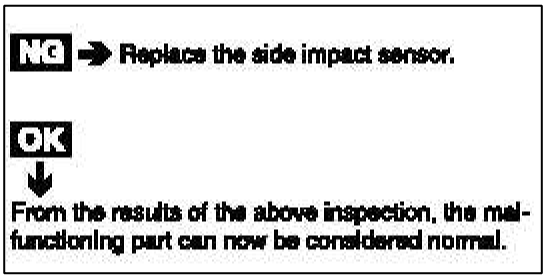


   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory of the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using the Hi-Scan Pro, check for DTCs.

   There is no DTC.

   [HINT]

   Codes other than these may be output at this time, but they are not relevant to this check.



NG → Replace the side impact sensor.

OK

↓

From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1511

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B1511 Driver seat buckle switch open/short to Battery B1512 Driver seat buckle switch short to GND B1513 Passenger seat buckle swithch open/short to Battery B1514 Passenger seat buckle swithch short to GND B1515 Driver seat buckle switch defect B1516 Passenger seat buckle switch defect

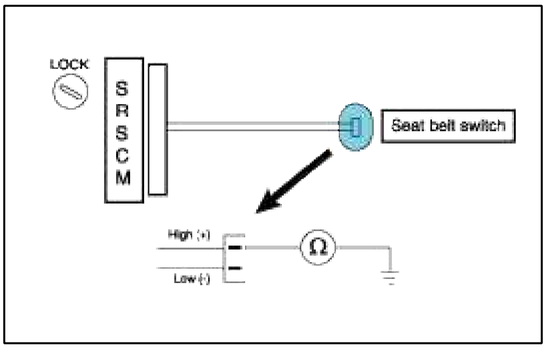
CIRCUIT DESCRIPTION

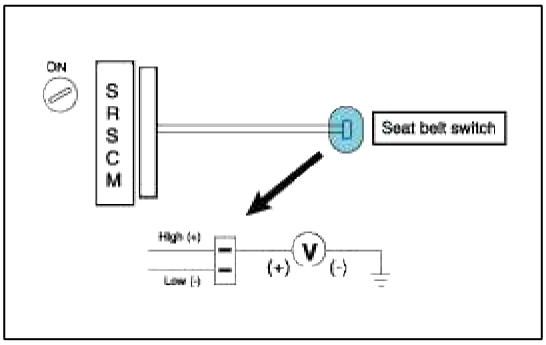
INSPECTION PROCEDURE

1. Preparation
   A. Disconnect the negative (-) terminal cable from the battery, and wait at least 30 seconds.
   B. Remove the DAB module.
   C. Disconnect the connectors of the PAB, left and right side airbags, belt pretensioners and satellite sensors.
   D. Disconnect the connector of theSRSCM.

> CAUTION
>
> Place the DAB with the front surface facing upward.

2. Check buckle switch sensor circuit (Short to GND/Battery).





[CHECK]

Measure the voltage and resistance of the seat track position sensor high and body ground between the SRSCM connector and the seat track position sesnor connector.

Resistance : ∞

Voltage : 0 V

NG → Repair or replace the harness between the SRSCM and the seat belt swtich.

OK
↓

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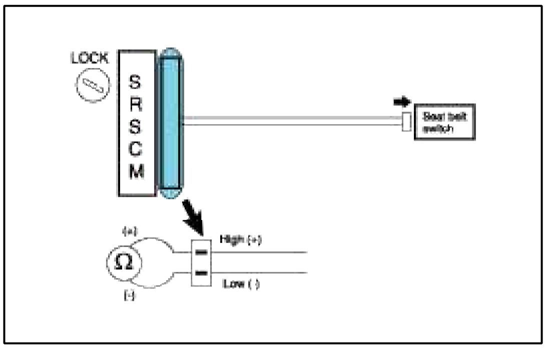
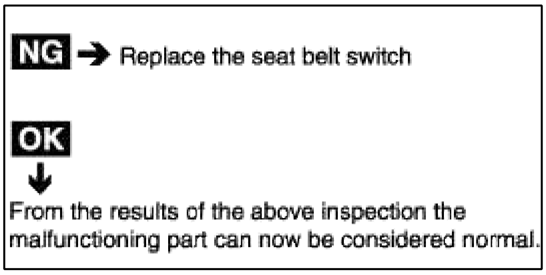
3. Check the seat belt switch.



[CHECK]

Check the resistance with the switch on and off.

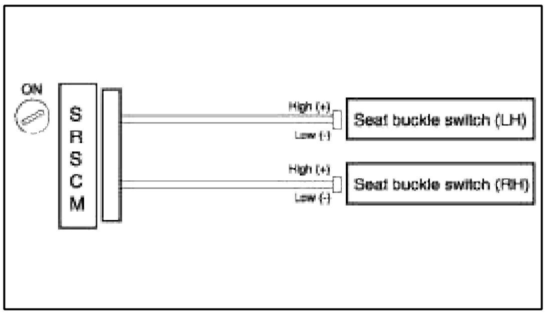
Buckled : 4.5mA < I < 5.5mA (R = 1000Ω ± 10%)
Unbuckled : 11.3mA < I < 13.8mA (R = 400Ω ± 10%)



NG → Replace the seat belt switch

OK
↓
From the results of the above inspection the malfunctioning part can now be considered normal.

4. Check the seat buckle switch (Defect).
   A. Turn the ignition switch to LOCK.
   B. Disconnect the negative (-) terminal cable from the battery, and wait for 30 seconds.
   C. Connect the seat buckle switch connector.
   D. Connect the negative (-) terminal cable to the battery, and wait for 30 seconds.

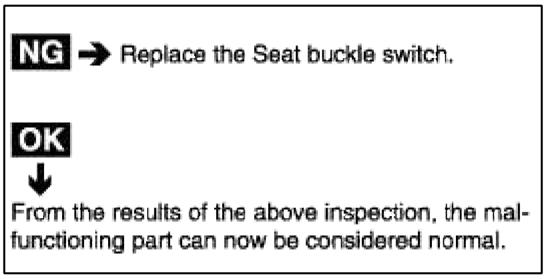


   A. Turn the ignition switch to ON, and wait for at least 30 seconds.
   B. Clear the malfunction code stored in the memory of the Hi-Scan Pro.
   C. Turn the ignition switch to LOCK, and wait for 30 seconds.
   D. Turn the ignition switch to ON, and wait for 30 seconds.
   E. Using the Hi-Scan Pro, check for DTCs.

   There is no DTC.

[HINT]

Codes other than these may be output at this time, but they are not relevant to this check.



NG → Replace the Seat buckle switch.

OK
↓
From the results of the above inspection, the malfunctioning part can now be considered normal.

Restraint > Troubleshooting > B1620

CIRCUIT INSPECTION (SRE-LC)

DTC	B1620 Internal fault B1650 Crash recorded (Frontal-Replace SRSCM) B1661 Parameter configuration missing/incorrect

CIRCUIT DESCRIPTION

1. Condition of the firing circuit activation transistors.
2. Adequacy of deployment energy reserves.
3. Safing sensor integrity. (detection of faulty closure)
4. Plausibility of the accelerometer signal.
5. Operation of the SRSCM components.

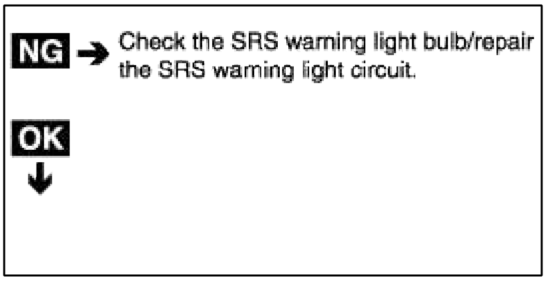
Restraint > Troubleshooting > B2500

CIRCUIT INSPECTION (SRE-LC)

DTC	B2500 Warning lamp failure

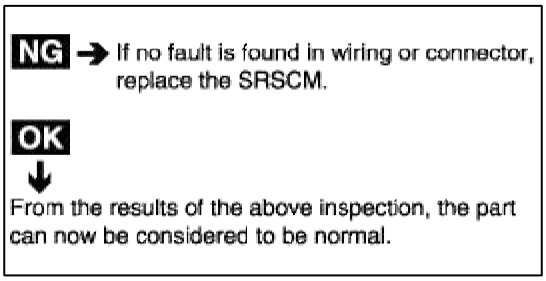
INSPECTION PROCEDURE

1. Check the fuse.
    A. Remove fuse airbag fuse and airbag warning lamp fuse from the junction block.
    B. Inspect the state of the fuses.
    C. Replace if necessary.
2. Check the SRS warning lamp circuit.
    A. Connect the negative (-) terminal cable to the battery.
    B. Turn the ignition switch to ON.
    A. Measure voltage at the harness side connector of the SRSCM.
    Voltage: 9-16 V



Check the SRS warning light bulb/repair the SRS warning light circuit.

    B. Check the SRS SRI (Service Reminder Indicator).
    OK: SRS SRI ON



If no fault is found in wiring or connector, replace the SRSCM.

From the results of the above inspection, the part can now be considered to be normal.

CIRCUIT INSPECTION (DUAL STAGE AIRBAG)

DTC	B2500 Warning lamp failure

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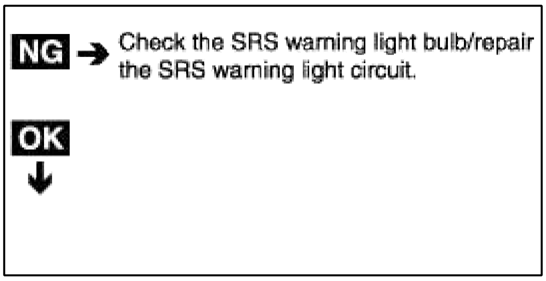
INSPECTION PROCEDURE

1. Check the fuse.
    - A. Remove fuse airbag fuse and airbag warning lamp fuse from the junction block.
    - B. Inspect the state of the fuses.
    - C. Replace if necessary.
2. Check the SRS warning lamp circuit.
    - A. Connect the negative (-) terminal cable to the battery.
    - B. Turn the ignition switch to ON.
    - A. Measure voltage at the harness side connector of the SRSCM.

      Voltage : 10-16.5 V

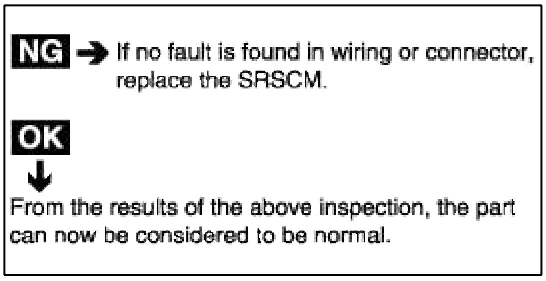


NG → Check the SRS warning light bulb/repair the SRS warning light circuit.

OK ↓

   - B. Check the SRS SRI (Service Reminder Indicator).

     OK : SRS SRI ON



NG → If no fault is found in wiring or connector, replace the SRSCM.

OK ↓

From the results of the above inspection, the part can now be considered to be normal.

ACCENT(LC) > 2005 > G 1.5 SOHC > Steering System

Steering System > General Information > General Information

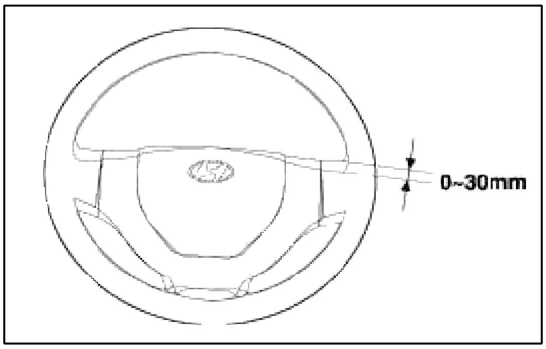
GENERAL

CHECKING STEERING WHEEL FREE PLAY

1. Start the engine with the steering wheel in the straight ahead position.
2. Measure the play at the circumference of the steering wheel.

Standard value

Steering wheel free play : 0~30 mm (0~1.1 in.)



3. If the play exceeds the standard value, inspect the connection between the steering shaft and steering linkage.

CHECKING STEERING ANGLE

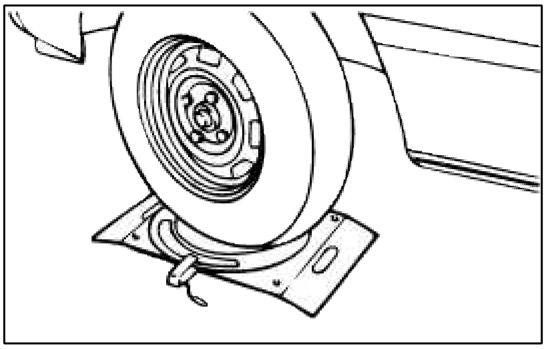
1. Place the front wheel on a turning radius gauge and measure the steering angle.

Standard value

Wheel angle (Unladen state)

Inner wheel : 37°37′ ± 1°30′

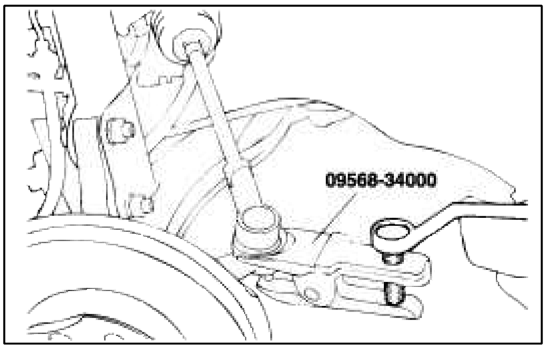
Outer wheel : 31°51′



2. If the measured value is not within the standard value, adjust the toe and inspect again.

CHECKING THE TIE ROD END BALL JOINT STARTING TORQUE

1. Disconnect the tie rod and knuckle by using the special tool.



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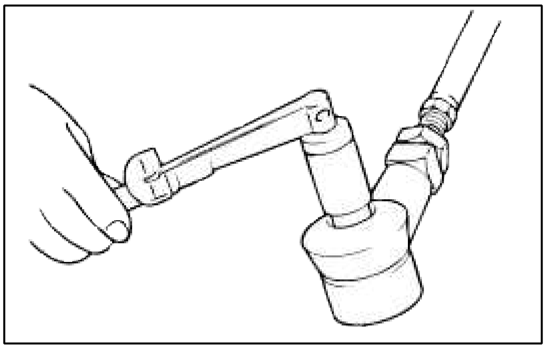
2. Move the ball joint stud in a circular motion several times to check for looseness.
3. Mount the nuts on the ball joint, and then measure the ball joint starting torque.

Standard value
0.5~2.5 Nm (5~25 kg·cm, 0.36~1.78 lb·ft)



4. If the starting torque exceeds the upper limit of the standard value, replace the tie rod end.
5. Even if the starting torque is below the lower limit of the standard value, check the play of the ball joint and replace if necessary.

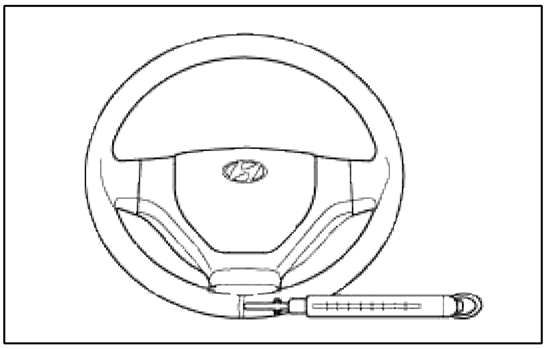
CHECKING STATIONARY STEERING EFFORT

1. Position the vehicle on a level surface and place the steering wheel in the straight ahead position.
2. Increase the engine speed to 1000 ± 100 rpm.

> NOTE
>
> After checking, reset the engine speed to the standard value (idling speed).

3. Measure the turning force with a spring scale by turning the steering wheel clockwise and counterclockwise one and a half turns.

Standard value
Stationary steering effort : 34.3N (3.5 kg, 7.8 lbs)



4. Check that there is no sudden change of force while turning the steering wheel.
5. If the stationary steering effort is excessive, check and adjust the following points.
   (1) Damage or cracks on the dust cover and tie rod end ball joint.
   (2) Pinion preload of the steering gear box and starting torque of the tie rod end ball joint.
   (3) Starting torque of the ball joint.

CHECKING STEERING WHEEL RETURN

1. The force required to turn the steering wheel and the wheel return should be the same for both left and right in case of moderate or sharp turns.

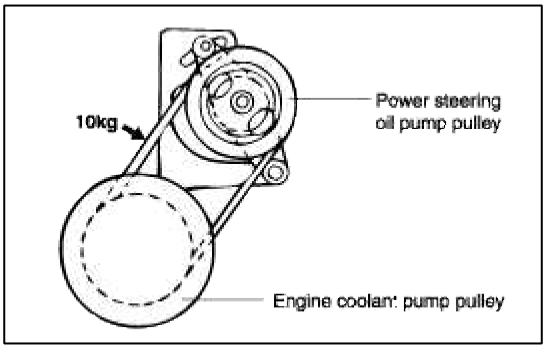
2. When the steering wheel is turned 90° and held for a couple of seconds while the vehicle is being driven at 35kph, the steering wheel should return at least 70° from the neutral position when it is released.

> **NOTE**
>
> If the steering wheel is turned very quickly, steering may be momentarily difficult. This is not a malfunction because the oil pump output will be somewhat decreased.

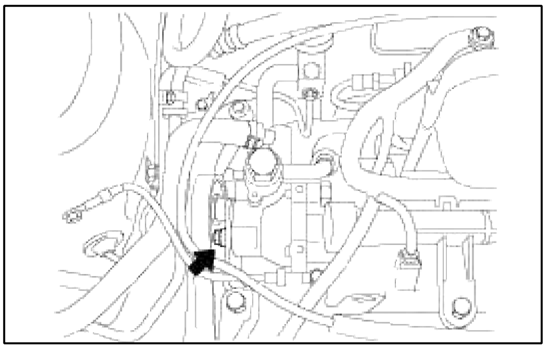
CHECKING POWER STEERING BELT TENSION

1. Press the V belt, applying a pressure of 98N (10kg, 22lb) at the specified point and measure the deflection to confirm that it is within the standard value.

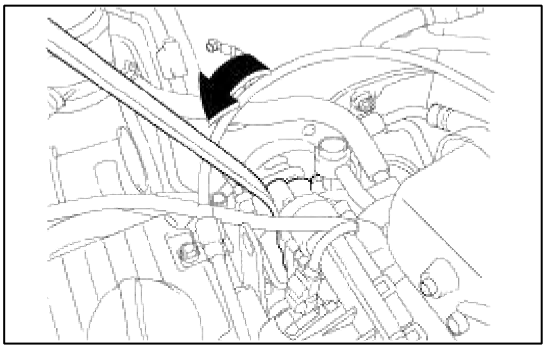
Standard value
V belt deflection : 7~10 mm



2. If the belt deflection is beyond the standard value, adjust the belt tension as follows.
   (1) Loosen the bolt adjusting the power steering "V" belt tension.



   (2) Put a bar or equivalent between the bracket and the oil pump and adjust the tension so that the belt deflection is within the standard value.



   (3) Tighten the bolt adjusting the power steering "V" belt tension.
   (4) Check the belt deflection and adjust it again if necessary.

> **CAUTION**
>
> After turning the V belt in the normal rotation direction more than once, recheck the belt deflection.

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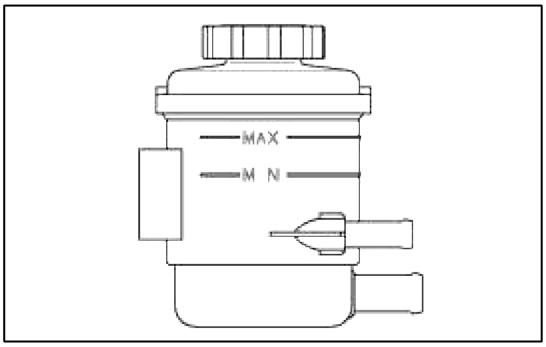
CHECKING POWER STEERING FLUID LEVEL

1. Position the vehicle on a level surface.
2. Start the engine. With the vehicle kept stationary, turn the steering wheel several times continuously to raise the fluid temperature to 50~60°C (122 to 140°F).
3. With the engine at idle, turn the steering wheel fully clockwise and counterclockwise several times.
4. Make sure there is no foaming or cloudiness in the reservoir fluid.
5. Stop the engine to check for any difference in fluid level between a stationary and a running engine.

NOTE

1. If the fluid level varies 5 mm (0.2 in.) or more, bleed the system again.
2. If the fluid level suddenly rises after stopping the engine, further bleeding is required.
3. Incomplete bleeding will produce a chattering sound in the pump and noise in the flow control valve, and lead to decreased durability of the pump

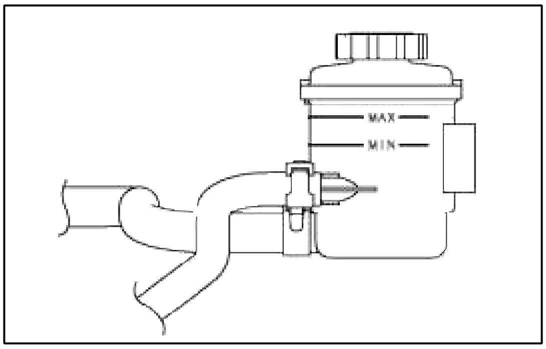


REPLACING POWER STEERING FLUID

1. Jack up the front wheels and support them with rigid racks.
2. Disconnect the return hose from the oil reservoir and plug the oil reservoir.
3. Connect a vinyl hose to the disconnected return hose, and drain the oil into a container.
4. Disconnect the high-tension cable at the ignition coil side.
   While operating the starter motor intermittently, turn the steering wheel all the way to the left and then to the right several times to drain the fluid.
5. Connect the return hose and fix it with a clip securely.
6. Fill the power steering fluid reservoir with the specified fluid.

   PSF-3 : 0.9 lit. (0.95 qts.)

7. Start the engine.
   Check for fluid leaks from the hose, then stop the engine.
8. Pour the fluid into the bottom of the oil filter in the power steering fluid reservoir.
9. Bleed the air.



AIR BLEEDING

1. Disconnect the ignition coil high tension cable, and then, while operating the starter motor intermittently (for 15 to 20 seconds), turn the steering wheel all the way to the left and then to the right five or six times.

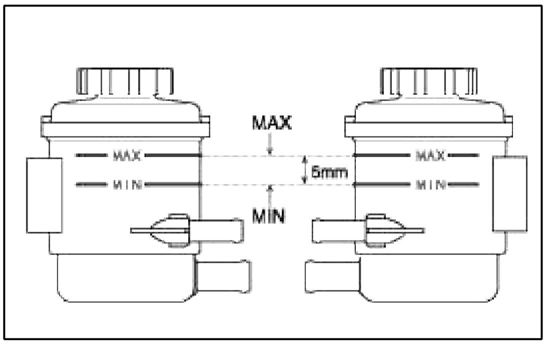
NOTE

1. During air bleeding, replenish with the fluid so that the level does not fall below the lower position of the filter.
2. If air bleeding is done while the vehicle is idling, the air will be broken up and absorbed into the fluid. Be sure to do the bleeding only while cranking.

2. Connect the high tension cable, and then start the engine (idling).
3. Turn the steering wheel to the left and then to the right, until there are no air bubbles in the oil reservoir.
4. Confirm that the fluid is not milky and that the level is between "MAX" and "MIN" marks on the reservoir.
5. Check that there is a little change in the fluid level when the steering wheel is turned left and right.

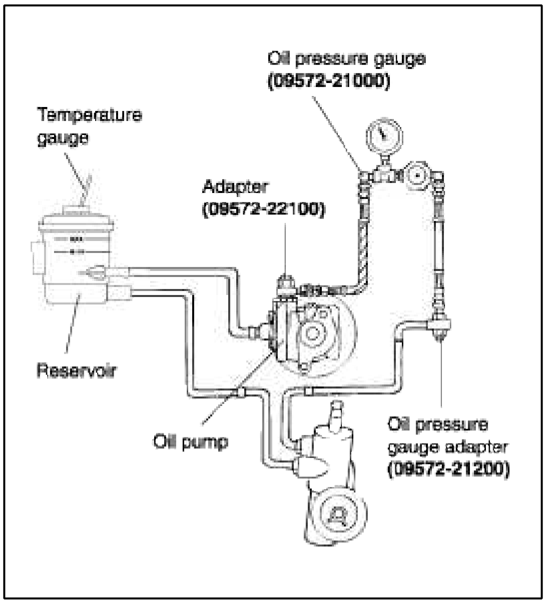
NOTE

1. If the fluid level varies 5mm (0.2 in.) or more, bleed the system again.
2. If the fluid level suddenly rises after stopping the engine, further bleeding is required.
3. Incomplete bleeding will produce a chattering sound in the pump and noise in the flow control valve, and lead to decreased durability of the pump.



OIL PUMP PRESSURE TEST

1. Disconnect the pressure hose from the pump. Connect the special tool between the pump and the pressure hose as illustrated.



2. Bleed the air, and then start the engine and turn the steering wheel several times so that the fluid temperature can rise to approximately 50-60°C (122-132°F) operating temperature.
3. Increase the engine speed to 1,000 ± 100 rpm.

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4. Close the shut-off valve of the special tool and measure the fluid pressure to confirm that it is within the standard value range.

Standard value

Relief pressure :
5.9 MPa (60 kg·cm², 853 psi)

CAUTION

Do not keep the shut-off valve on the pressure gauge closed for more than ten seconds.

5. If the fluid pressure is not within the standard value range, overhaul the oil pump.
6. Remove the special tools, and tighten the pressure hose to the specified torque.

Tightening torque

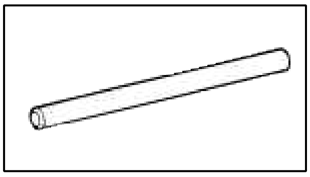
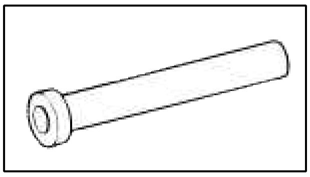
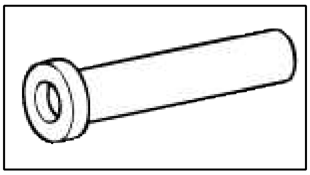
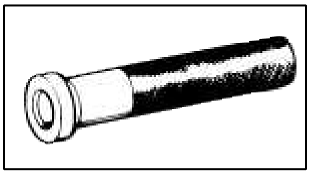
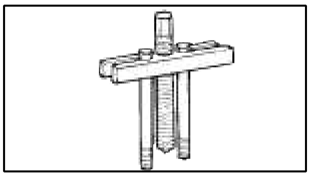
55~65 Nm (550~650 kg·cm, 40.6~47.9 lb·ft)

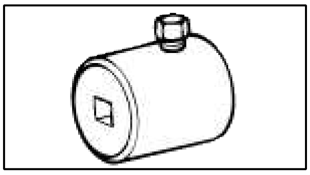
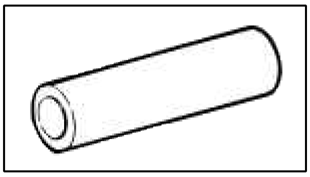
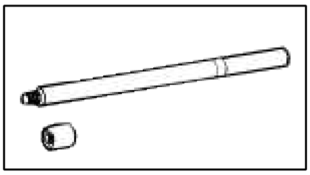
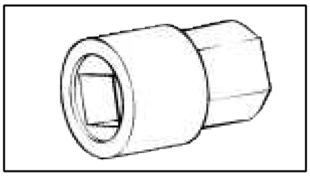
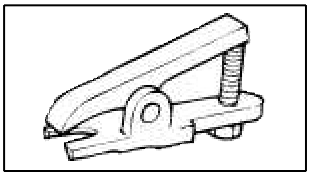
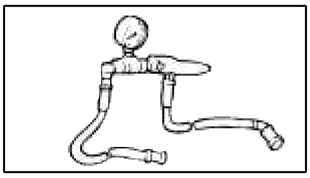
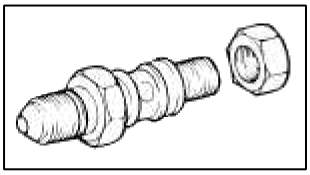
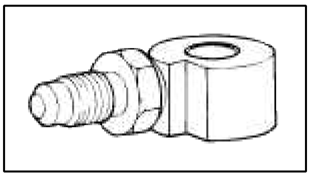
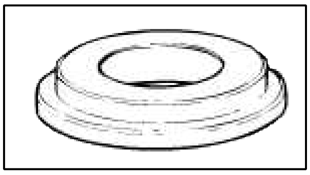
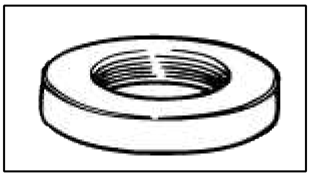
---

7. Bleed the system.

Steering System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and name)	Illustration	Use
09517-21400 Drift		Removal of pinion gear bearing
09222-21100 Valve stem oil seal installer		Installation of the pinion gear bearing
09432-21600 Bearing installer		Installation of oil pump oil seal.
09434-14200 Counter shaft bearing installer		Installation of the valve housing oil seal.
09561-11002 Steering wheel puller		Removal of the steering wheel

09565-11100 Preload socket		Measurement of the mainshaft pre-load.
09565-21000 Pinion bearing remover and installer		Removal & installation of pinion gear bearing and oil seal valve body housing.
09555-21000 Bar		Removal & installation of the oil seal from gear housing.
09565-21100 Yoke plug torque wrench socket		Removal, installation and adjustment of steering gear yoke plug.
09568-34000 Ball joint		Separation of the tie rod end ball joint.
09572-21000 Oil pressure gauge		Measurement of the power steering oil pressure. (use with 09572-21200, 09572-22100)
09572-21200 Oil pressure gauge adapter (Hose side)		Measurement of the power steering oil pressure. (use with 09572-21000, 09572-22100)
09572-22100 Oil pressure gaug adapter		Measurement of the power steering oil pressure. (use with 09572-21000, 09572-21200)
09573-21000 Oil seal installer guide		Installation of the oil seal (use with 09573-21100, 09573-21200, 09517-11000, 09555-21000)
09573-21100 Oil seal installer		Installation of the back-up washer and oil seal (use with 09573-21000, 09573-21200, 09555-21000)

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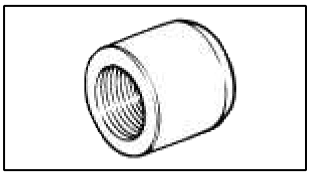
09573-21200 Oil seal guide		1. Removal of gear box oil seal and back washer. (use with 09555-21000) 2. Installation of gear box oil seal and back washer. (use with 09555-21000, 09573-21000).

Steering System > General Information > Troubleshooting

TROUBLESHOOTING (POWERSTEERING)

Symptom	Probable cause	Remedy
Excessive play in steering wheel	Loose yoke plug Loose steering gear mounting bolts Loose or worn tie rod end	Retighten Retighten Retighten or replace as necessary
Steering wheel operation is not smooth (Insufficient power assist)	Drive slippage Damaged Drive belt Low fluid level Air in the fluid Twisted or damaged hoses Insufficient oil pump pressure Sticky flow control valve Excessive internal oil pump leakage Excessive oil leaks from rack and pinion in gear box Distorted or damaged gear box or valve body seals	Check Replace Replenish Bleed air Correct the routing or replace Repair or replace the oil pump Replace Replace the damaged parts Replace the damaged parts Replace
Steering wheel does not return properly	Excessive turning resistance of tie-rod end Excessively tightened rack support cover Inner tie rod and/or ball joint cannot turn smoothly Loose mounting of gear box mounting bracket Worn steering shaft joint and/or body grommet Distorted rack Damaged pinion bearing Twisted or damaged hoses Damaged oil pressure control valve Damaged oil pump input shaft bearing	Replace Adjust Replace Retighten Correct or replace Replace Replace Reposition or replace Replace Replace
Noise	**Hissing Noise in Steering Gear** There is some noise with all power steering systems. One of the most common is a hissing sound when the steering wheel is turned and the car is not moving.This noise will be most evident then turning the wheel while the brakes are being applied. There is no relationship between this noise and steering performance. Do not replace the valve unless the "hissing" noise becomes extreme. A replaced valve will also make a slight noise, and is not always a solution for the condition.	

Rattling or chucking noise in the rack and pinion	Interference with hoses from vehicle body Loose gear box bracket Loose tie rod end and/or ball joint Worn tie rod and/or ball joint	Reposition Retighten Retighten Replace
Noise in the oil pump	Low fluid level Air in the fluid Loose pump mounting bolts	Replenish Bleed air Retighten

NOTE

A slight "grinding noise" may be heard immediately after the engine is started in extremely cold whether conditions (below-20°C) : This is due to power steering fluid characteristics in extreme cold conditions and is not an indication of malfunction.

TROUBLESHOOTING (MANUAL STEERING)

Symptom	Probable cause	Remedy
Excessive play in steering wheel	Loose rack support cover Loose steering gear mounting bolts Loose or worn tie-rod end	Retighten Retighten Retighten or replace as necessary
Steering wheel operation is hard	Excessive turning resistance of tie-rod ball joint Excessively tightened rack support cover Inner tie rod and/or ball joint cannot turn smoothly Distorted rack Worn steering shaft joint and/or body grommet Damaged pinion bearing	Replace Adjust Lubricate or replace ball joint Replace Replace Replace
Steering wheel does not return properly	Excessive turning resistance of tie-rod ball joint Excessively tightened rack support cover Inner tie rod and/or ball joint cannot turn smoothly Worn steering shaft joint and/or body grommet Distorted rack Damaged pinion bearing	Replace Adjust Replace Correct or replace Replace Replace

Steering System > General Information > Specifications

SPECIFICATIONS

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Item	Specification
Manual steering	
Shaft and joint type	Collapsible, cross joints (two joints used)
Steering gear type	Rack and pinion
Rack stroke	134mm (lock to lock : 3.87 turns)
Power steering	
Shaft and joint type	Collapsible, cross joints, tilt column with pop-up
Steering gear type	Rack and pinion
Rack stroke	134mm (lock to lock : 2.93 turns)
Oil pump type	Vane type
Oil pump displacement	9.6cm^3/rev. (0.59 in^3/rev.)
Oil pump pressure switch operating pressure	1.5-2.0 MPa (15-20 kg/cm^2, 213-284 psi)

SERVICE STANDARD

Item	Specification
Manual steering	
Steering wheel free play	0-30 mm (0-1.1 in.)
Steering angle	
Inner wheel	37°37′ ± 1°30′
Outer whel	31°51′
Tie rod end ball joint starting torque	0.5-2.5 Nm (5-25 kg·cm, 0.4-1.8 lb·ft)
Total pinion preload	
±180° or less from neutral	0.4-1.1 Nm (4-11 kg·cm, 0.3-0.8 lb·ft)
±180° or more from neutral	0.3-1.6 Nm (3-16 kg·cm, 0.2-1.2 lb·ft)
Tie rod swing resistance	2-5 Nm (20-50 kg·cm, 1.4-3.6 lb·ft)
Power steering	
Steering wheel free play	0-30 mm (0-1.1 in.)
Steering angle	
Inner wheel	37°37′ ± 1°30′
Outer wheel	31°51′
Stationary steering effort	34.3 N (3.5 kg, 7.8 lbs) or less
Belt deflection [under 98N (10kg, 22lb) force]	7-10 mm
Oil pump relief pressure	5.9MPa (60 kg/cm^2, 853 psi)
Total pinion preload	0.6-1.3 Nm (6-13 kg·cm, 0.4-1.0 lb·ft.)
Tie rod swing resistance	2-5 Nm (20-50 kg·cm, 1.4-3.6 lb·ft)

TIGHTENING TORQUE

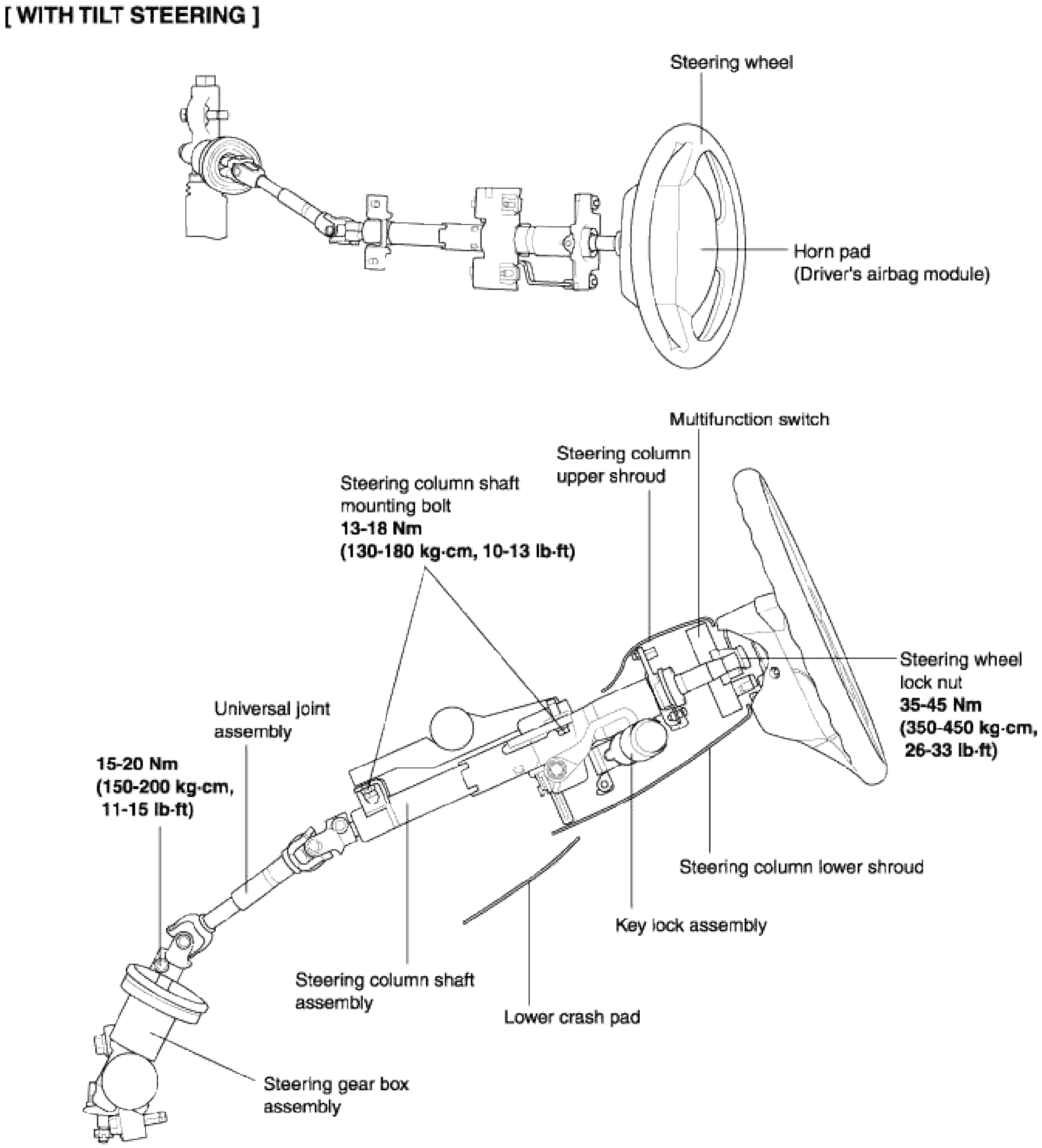
Item	Nm	kg·cm	lb·ft
Steering wheel lock nut	35-45	350-450	26-33
Steering column and shaft assembly	13-18	130-180	10-13
mounting bracket	15-20	150-200	11-15
Steering shaft and joint	15-20	150-200	11-15
Pinion gear and joint	4-6	40-60	3-4.4
Dust cover mounting bolt	60-80	600-800	44-59
Gear box mounting bolt	50-55	500-550	37-41
Tie rod end lock nut	16-34	160-340	12-25
Tie rod ball joint slotted nut	50-70	500-700	37-52
Rack yoke plug nut	80-100	800-1000	59-74
Tie rod to rack			
Power Steering Only			
Valve body housing to rack housing	20-30	200-300	15-22
assembly	8-12	80-120	6-9
Pressure and return tube mounting clip	12-18	120-180	9-13
Pressure and return tube to gear box	20-30	200-300	15-22
Pinion and return valve assembly to self-	50-70	500-700	37-52
locking nut	20-27	200-270	15-20
End plug	25-33	250-330	18-24
Oil pump mounting bracket bolt	55-65	550-650	40.6-47.9
Oil pump adjusting bolt	9-14	90-140	7-10
Pressure hose mounting bolt (to oil pump)	3-5	30-50	2.2-3.6
Oil reservoir mounting bolt	4-6	40-60	3-4.4
Suction hose mounting clamp			
(to oil pump suction connector)			
Oil cooler tube mounting bolt			

LUBRICANTS

Item	Recommended lubricant	Quantity
Horn contact ring of steering wheel	LONG TIME PD2 (OPTIMOL, GERMAN)	As required
Bearing of steering shaft	ALVANIA #2 or #3 (KEUK DONG SHELL, KOREA)	As required
Ball joint of tie rod end	VALIANT R-2 (SHOSEK I, JAPAN)	As required
Steering gear housing	ONE-LUBER RP (KYODOYUSHI, JAPAN)	As required
Inner ball joint of gear box	LONG TIME PD2 (OPTIMOL, GERMAN)	As required
Contact area of gear box bellows & tie rod	SILICON GREASE	As required
Power steering fluid	PSF-3 TYPE	0.9 liter (0.5 qts.)

Steering System > Steering Column & Shaft > Steering Column/Shaft > Components and Components Location

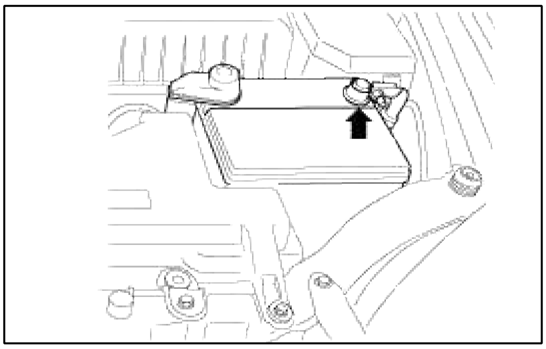
COMPONENTS


[WITH TILT STEERING]
Steering wheel
Horn pad
(Driver's airbag module)
Multifunction switch
Steering column
upper shroud
Steering column shaft
mounting bolt
13-18 Nm
(130-180 kg·cm, 10-13 lb·ft)
Universal joint
assembly
15-20 Nm
(150-200 kg·cm,
11-15 lb·ft)
Steering wheel
lock nut
35-45 Nm
(350-450 kg·cm,
26-33 lb·ft)
Steering column lower shroud
Key lock assembly
Steering column shaft
assembly
Lower crash pad
Steering gear box
assembly

Steering System > Steering Column & Shaft > Steering Column/Shaft > Repair procedures

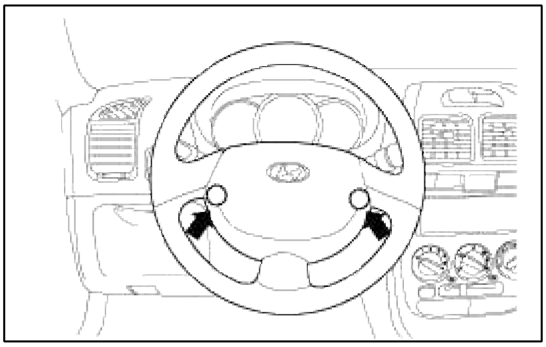
REMOVAL

1. Disconnect the (-) negative terminal from the battery.

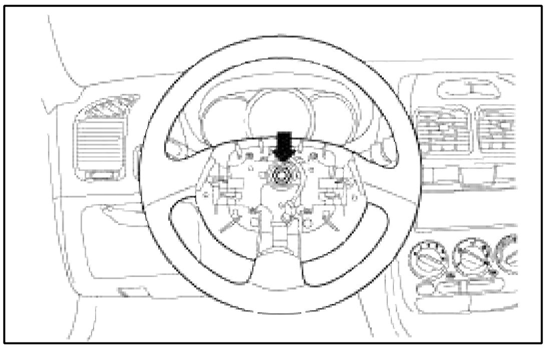


2. After removing the bolts in the illustration, remove the driver's airbag module.

> **NOTE**
>
> For the vehicles not equipped with SRS airbag, remove the horn cover assembly.

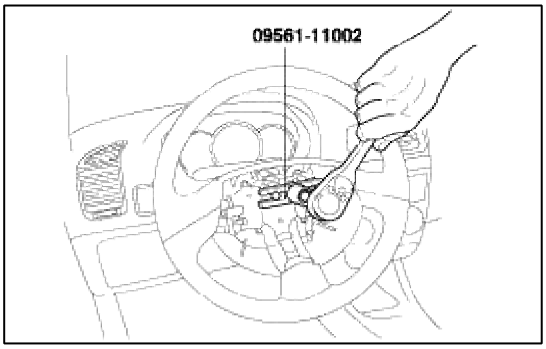


3. Remove the steering wheel lock nut.



4. After aligning the marks on the steering shaft and wheel, remove the steering wheel using the special tool.

> **NOTE**
>
> Do not hammer on the steering wheel to remove it, doing so may damage the steering column.



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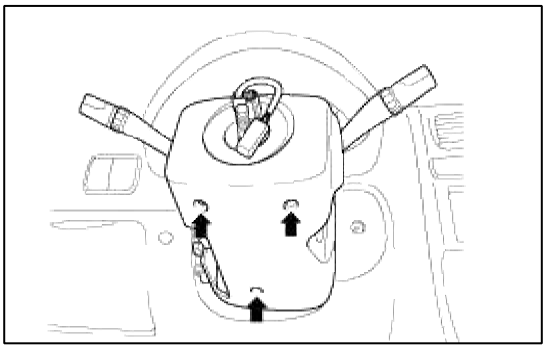
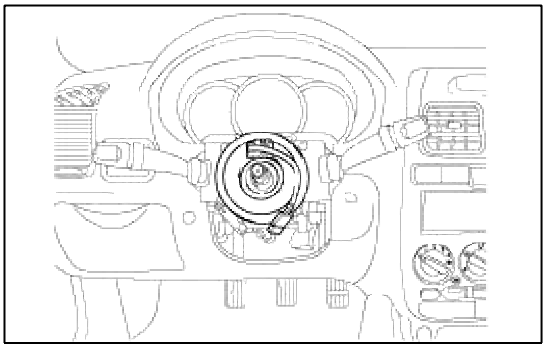
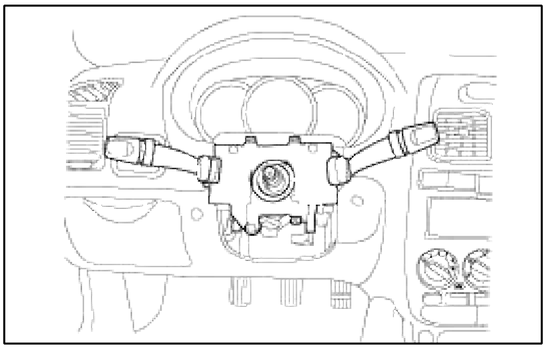
5. After removing the 3 bolts in the illustration, remove the steering column shroud.



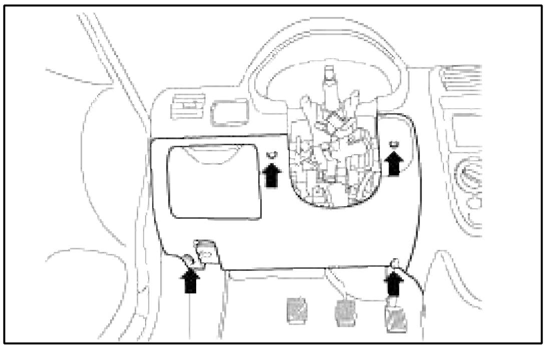
6. Remove the connectors of the airbag clock spring and the multifunction switch.



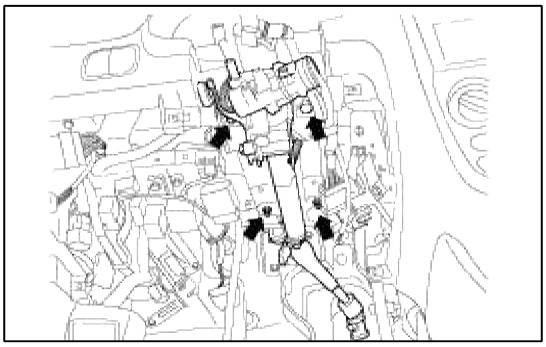
7. Remove the multifunction switch assembly from the steering shaft.



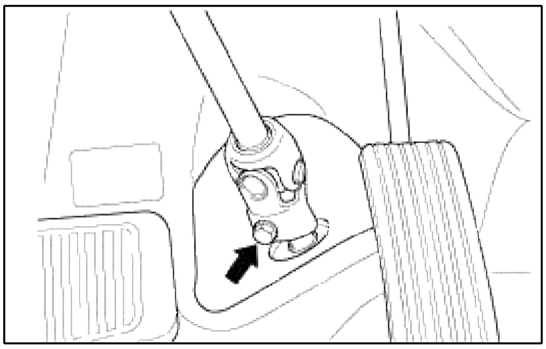
8. After removing 4 connecting bolts, remove the lower crash pad.



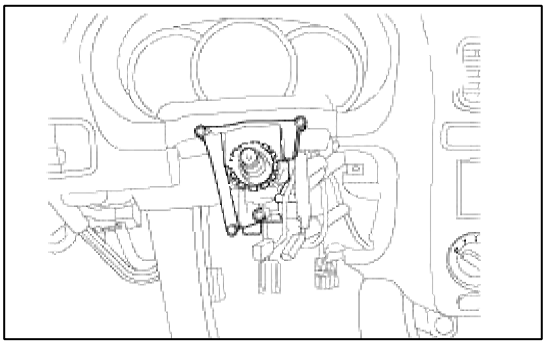
9. Remove the 4 bolts fixing the steering column shaft.



10. Remove the bolt from the universal joint and gear box connecting portion.

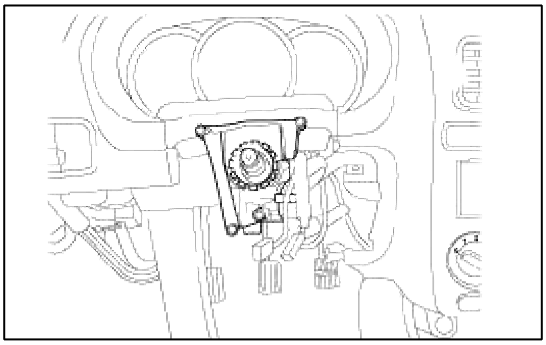


11. Remove the steering column shaft assembly.

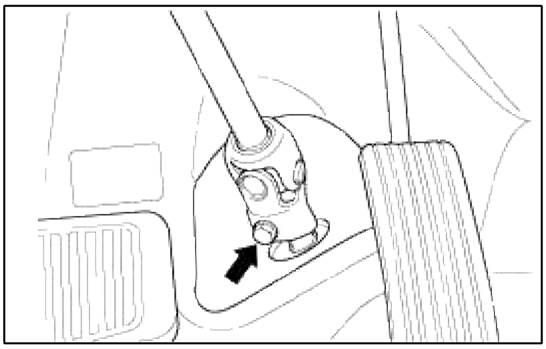


INSTALLATION

1. Place the steering columnshaft in position and install the 4 mounting bolts temporarily.



2. Install the bolt on the universal joint and gear box connecting part in the driver's side brake pedal lower portion.



> **CAUTION**
>
> • Lock the steering wheel in the straight ahead position to prevent the damage of the clock spring inner cable when you handle the steering wheel.

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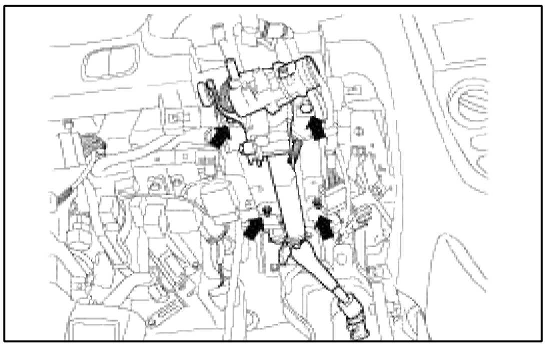
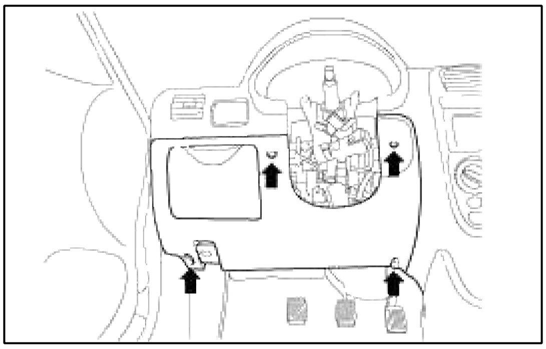
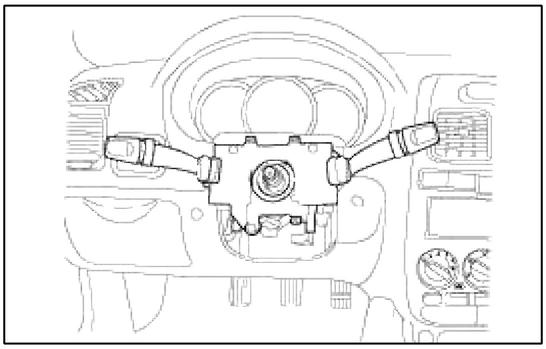
3. Completely tighten the temporarily installed 4 mounting bolts on the steering column shaft.



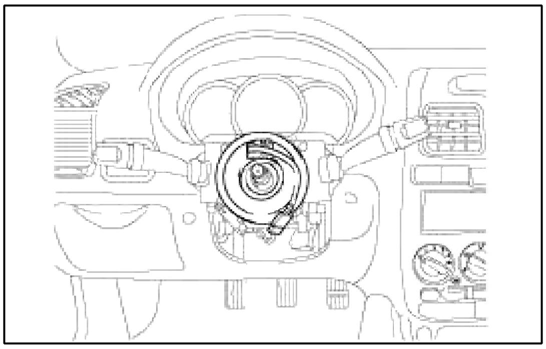
4. After installing the lower crash pad, tighten the 4 bolts.



5. Install the multi-function switch to the steering column shaft by pushing it until it reashes the marked portion.



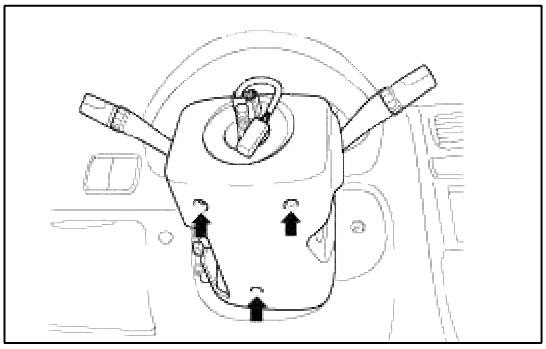
6. Install the SRS clock spring and multi-function switch connector.



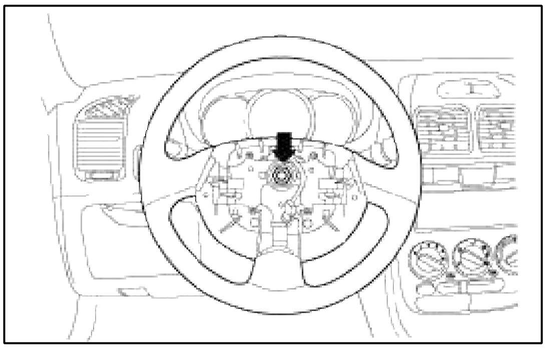
CAUTION

•When assembling the clock spring, set the center position by setting the marks between the clock spring and the cover into line. Make an array the mark (   ) by turning the clock spring clockwise to the stop and then 2.0 revolutions counterclockwise.

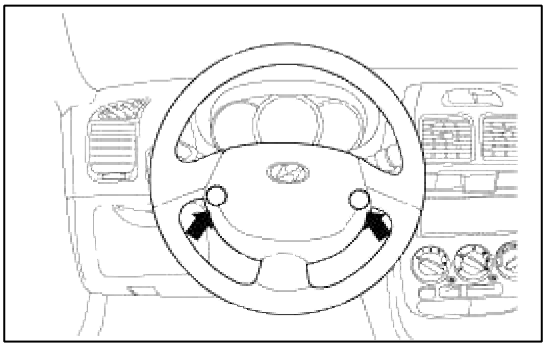
7. After installing the upper/lower column shroud, tighten the 3 bolts.



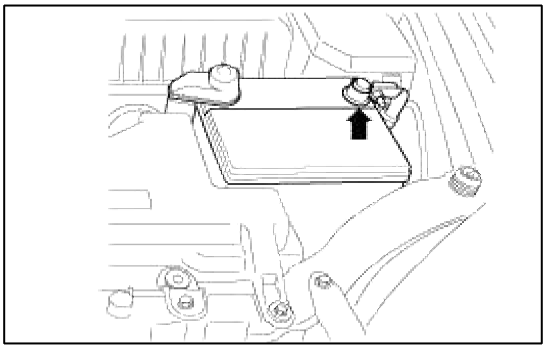
8. Fix the steering wheel with a lock nut.



9. Fix the SRS module to the steering wheel with 2 bolts.



10. Connect the (-) negative battery cable.



INSPECTION

1. Check the steering column shaft for damage and deformation.
2. Check connections for play, damage and smooth operation.
3. Check the ball joint bearing for wear and damage.

Steering System > Manual Steering System > Manual Steering Gear Box > Components and Components Location

COMPONENTS

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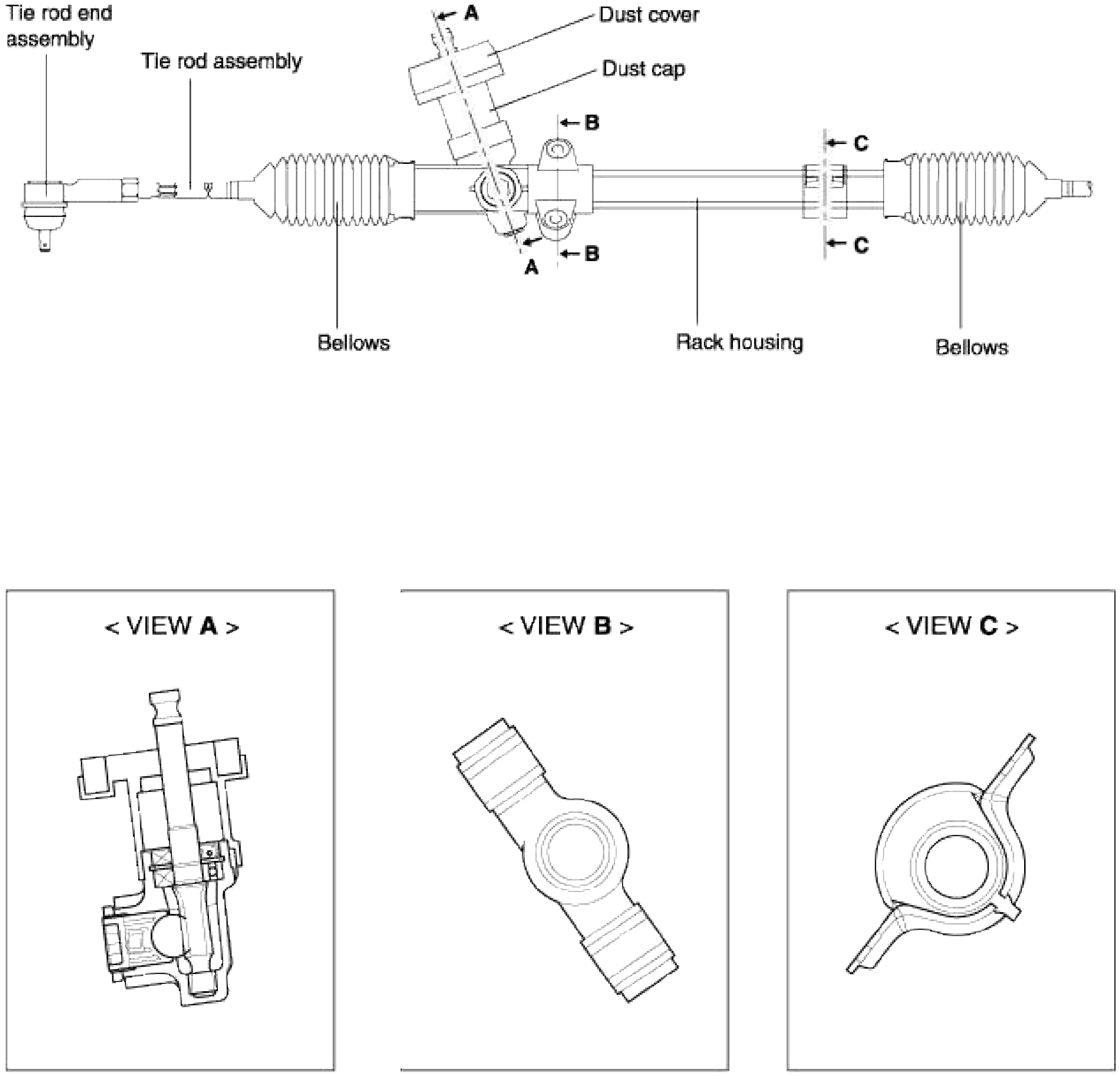
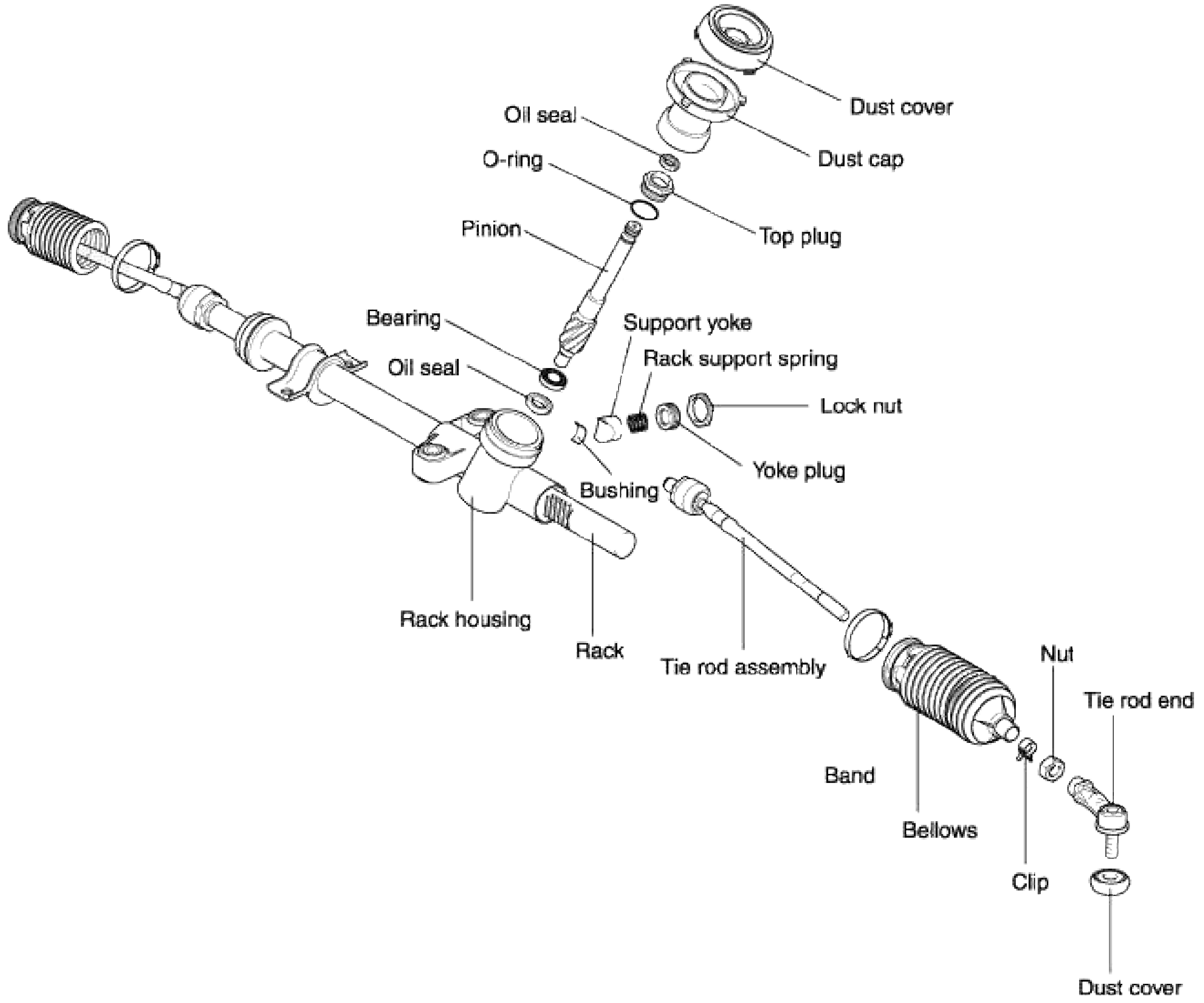

Tie rod end assembly
Tie rod assembly
A
Dust cover
Dust cap
B
C
A
B
C
Bellows
Rack housing
Bellows
< VIEW A >
< VIEW B >
< VIEW C >

COMPONENTS


Dust cover
Oil seal
Dust cap
O-ring
Top plug
Pinion
Bearing
Support yoke
Rack support spring
Oil seal
Lock nut
Yoke plug
Bushing
Rack housing
Rack
Tie rod assembly
Nut
Tie rod end
Band
Bellows
Clip
Dust cover

Steering System > Manual Steering System > Manual Steering Gear Box > Repair procedures

REMOVAL

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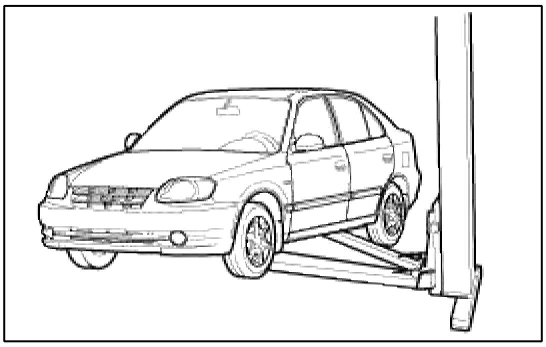
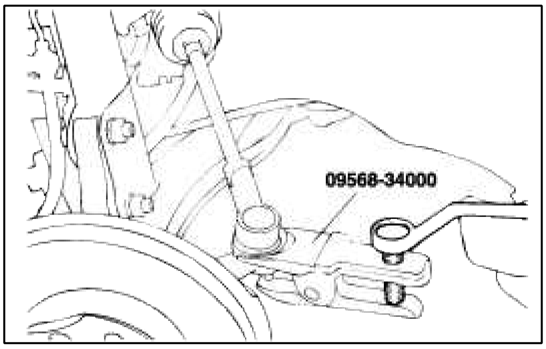
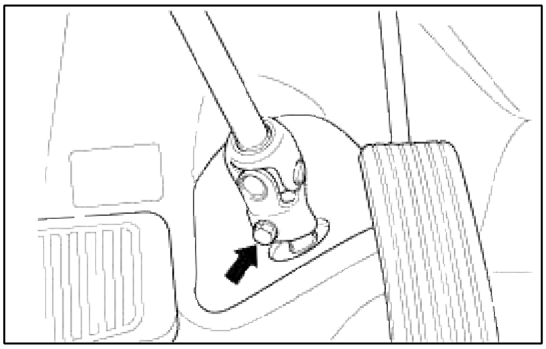
1. Support the specified point of the vehicle with a lift.



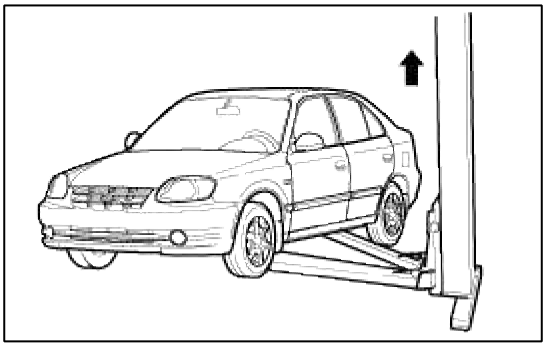
2. Remove the front tires (RH/LH).
3. After removing the split pin, disconnect the tie rod from the knuckle by using the speicial tool.



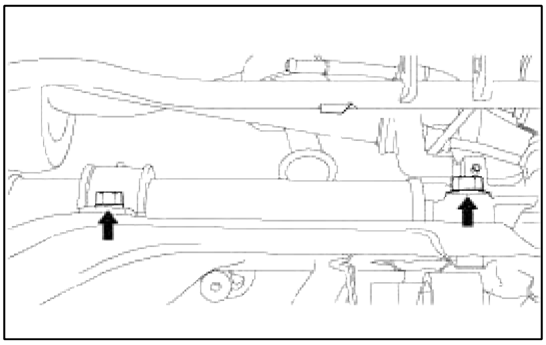
4. Disconnect the shaft assembly from the gear box inside the passenger compartment.



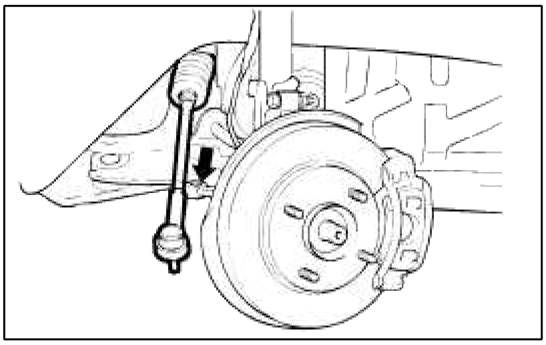
5. Raise up the vehicle.



6. Remove the manual steering gear box mounting bolt and clamp.

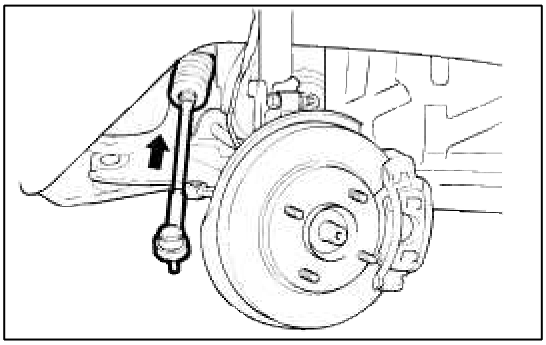


7. Separate the manual steering gear box assembly by pulling it toward the right side of the vehicle.

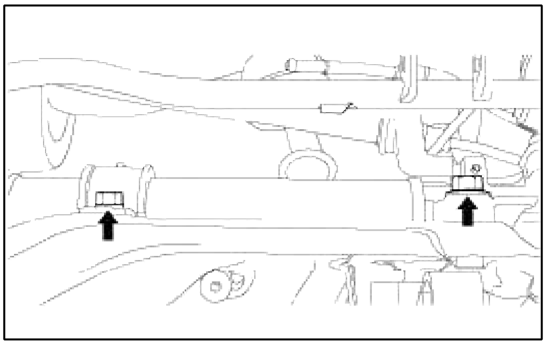


INSTALLATION

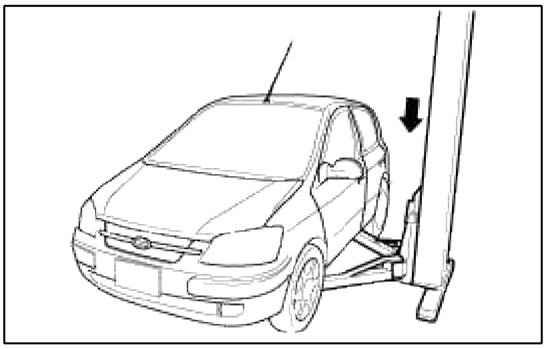
1. Install the manual steering gear box assembly by inserting it from the right side.



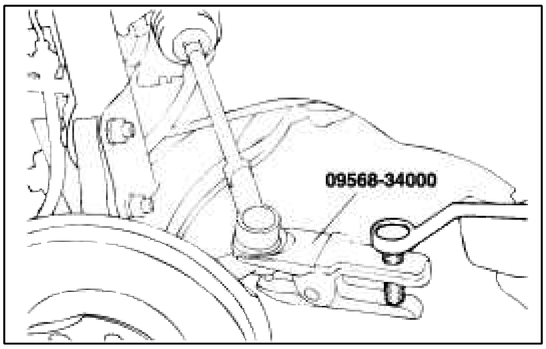
2. Fix the manual steering gear box to the crossmember.



3. Lower the vehicle.



4. Connect the tie rod to the LH/RH knuckles.



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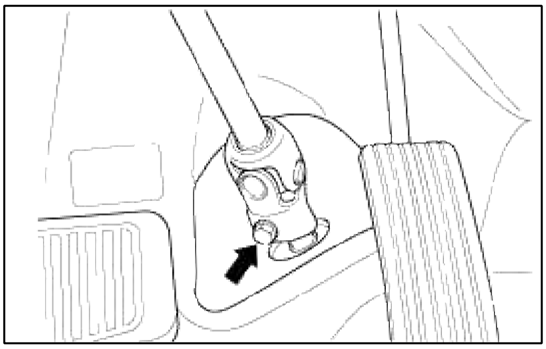
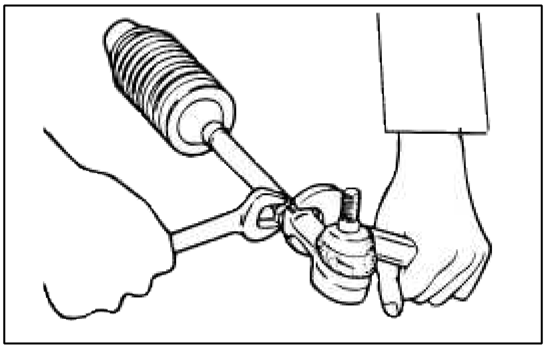
5. Install the tires (LH/RH).
6. Connect the steering shaft assembly to the gear box in the passenger compartment.

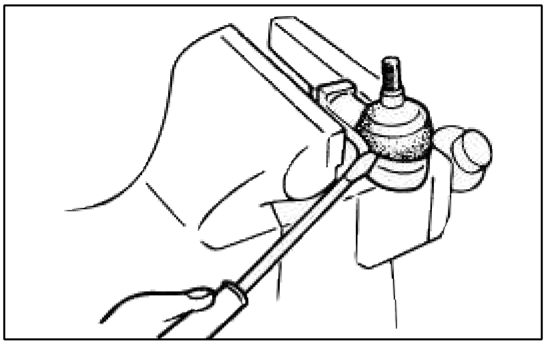


DISASSEMBLY

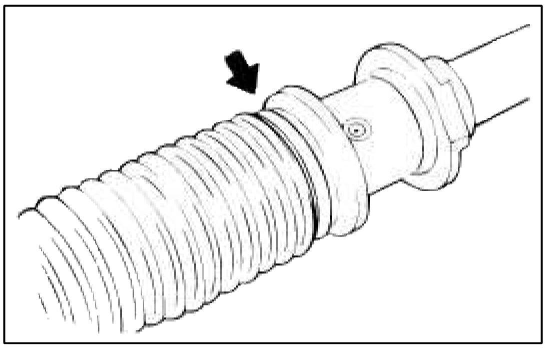
1. Remove the tie rod end from the tie rod.



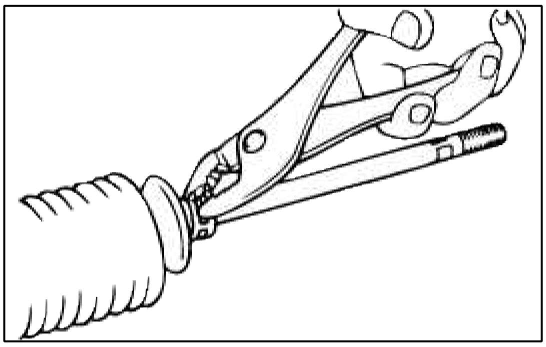
2. After mounting the tie rod end in a vise, remove the dust cover from the ball joint.



3. Remove the bellows band.



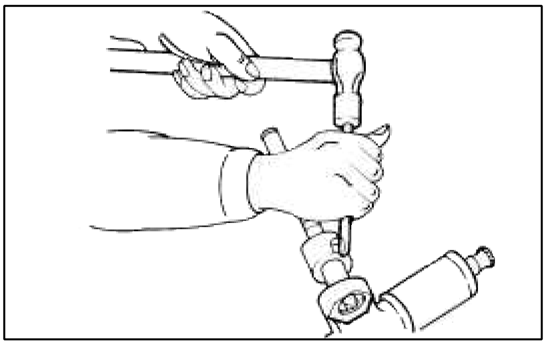
4. Remove the bellows clip.



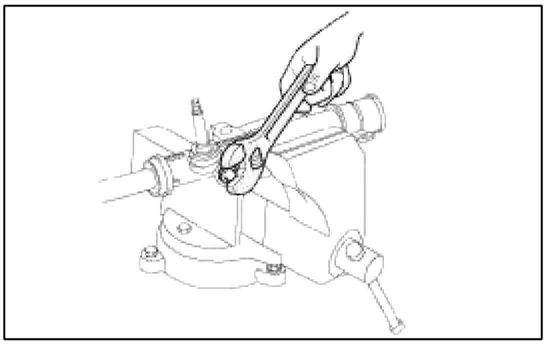
5. Pull the bellows out toward the tie rod.

> **NOTE**
>
> Check for rust on the rack when the bellows are replaced.

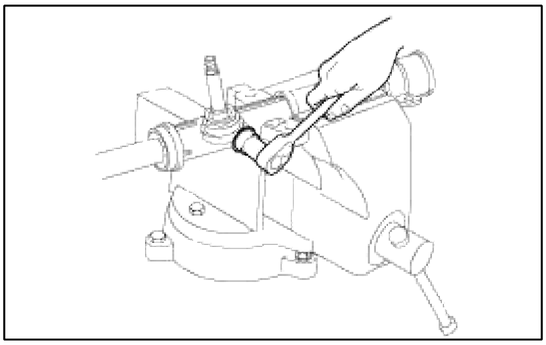
6. Unstake the tab washer which fixes the tie rod and rack with a chisel.



7. Remove the yoke plug lock nut.



8. Remove the yoke plug with a 14mm socket.



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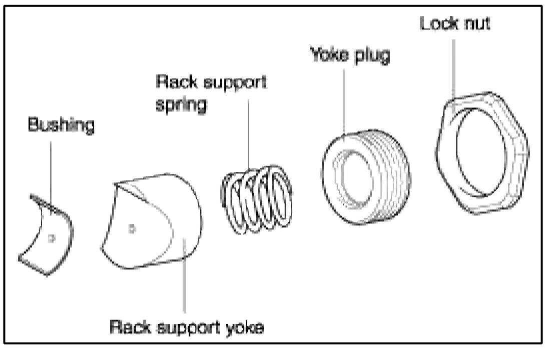
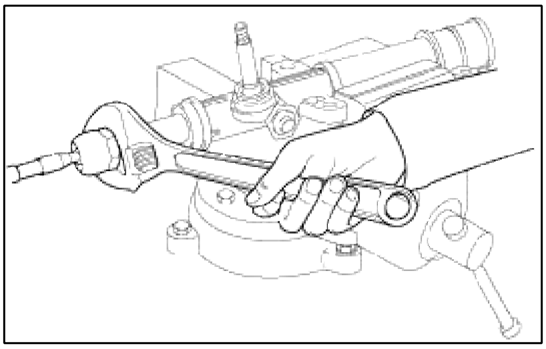
9. Remove the lock nut, yoke plug rack support spring, rack support yoke and bushing.

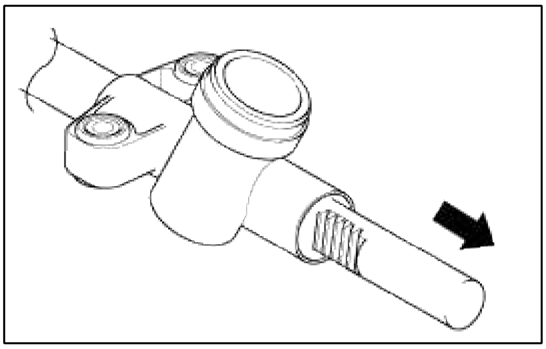

Lock nut
Yoke plug
Rack support spring
Bushing
Rack support yoke

10. Move the rack completely toward the housing and mount the rack tooth portion in a brass plate of a vise. At the state of step 11, loosen the tie rod ball joint, then remove the tie rod assembly from the rack.



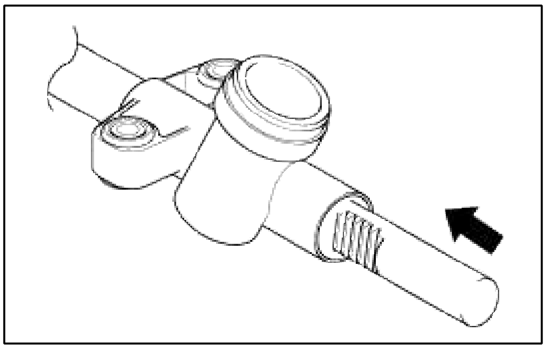
11. Remove the rack from the gear housing.

> CAUTION
>
> Remove the rack toward the left side of the vehicle so as not to damage the bushing by the rack teeth.



REASSEMBLY

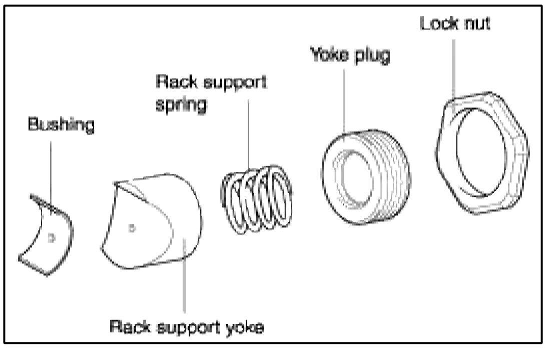
1. Apply the specified grease to the rack, insert the rack into the gear housing, and then insert the pinion into the gear housing.
   A. Make sure that the rack is inserted into the gear housing from the left side.
   B. When inserting the pinion into the gear housing, the pinion gear should be in mesh with the rack gear.
   C. Wipe off excessive grease.



2. Prior to oil seal installation in the gear box, apply grease to the surface of the oil seal.

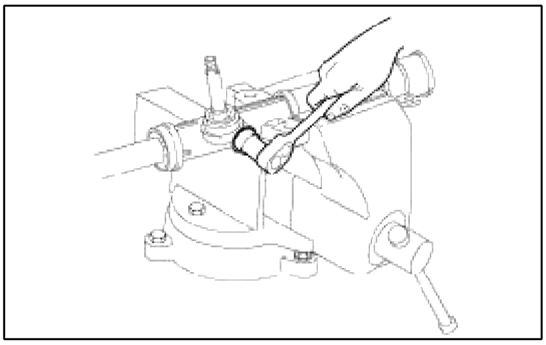
> **NOTE**
>
> Be sure to use a new oil seal.

3. Install the rack support yoke, rack support spring, yoke plug, and lock nut to the pinion gear box.



4. Tighten the yoke plug to 11Nm (112 kg·cm, 8 lb·ft) and then back off 30°~60°. Secure the yoke plug with the lock nut.

> **CAUTION**
>
> 1. Adjust the yoke plug with the rack in the neutral position.
> 2. Apply a sealer between the lock nut and the housing.



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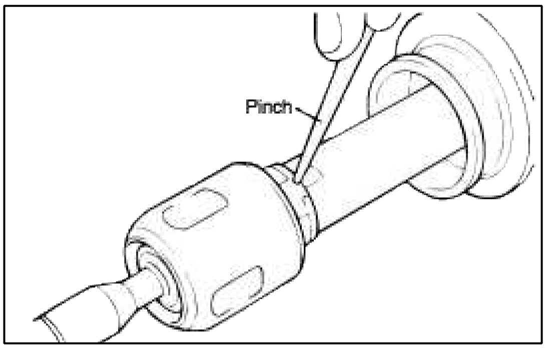
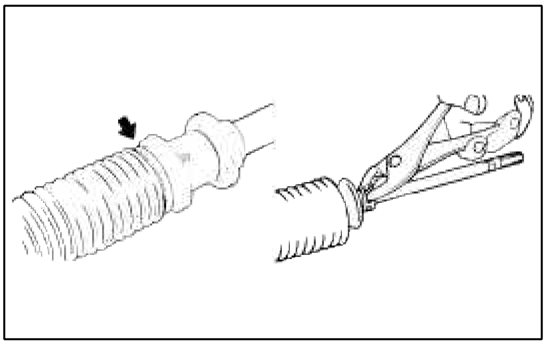
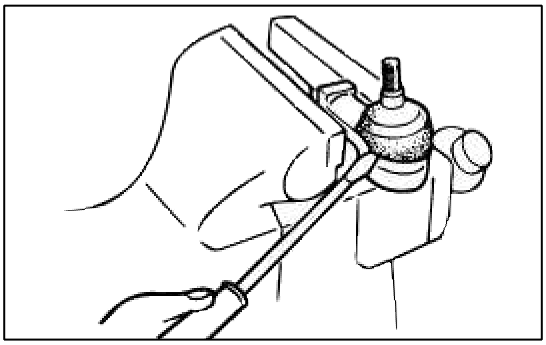
5. After installing the tie rod to the rack, punch on a point over the tie rod with a chisel.



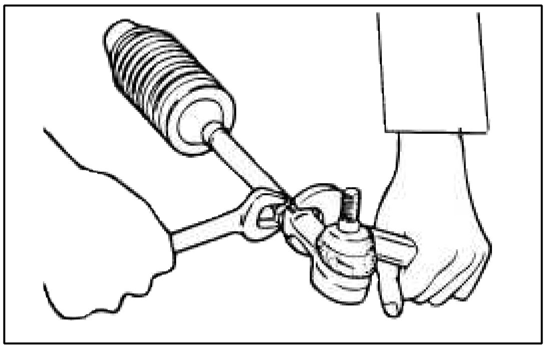
6. Install the bellows in position and fix it with the band and clip.



7. Mount tie rod end in a vise and install the dust cover to the tie rod end.



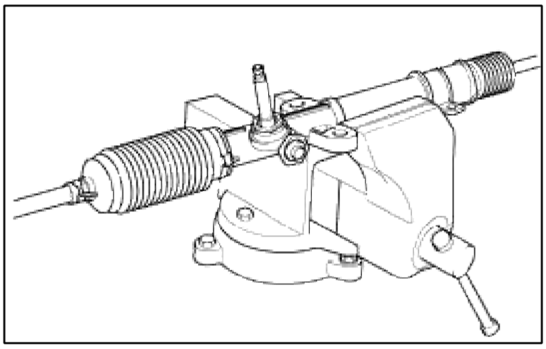
8. Install the tie rod to the tie rod end.



INSPECTION AND ADJUSTMENT BEFORE DISASSEMBLY

CAUTION

When mounting the gear box in a vise, let the installation section of it be fixed to the jaws. If other section is fixed the gear box may be damaged.



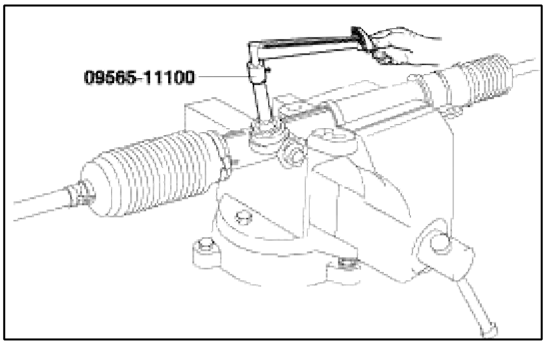
TOTAL PINION PRELOAD

1. Rotate the pinion gear for approximately 4 to 6 seconds for one rotation to measure the total pinion preload.

Standard value
0.6~1.3 Nm (6~13 kg·cm, 0.4~1.0 lb·ft)

NOTE

Measure the pinion preload through the entire stroke of the rack.

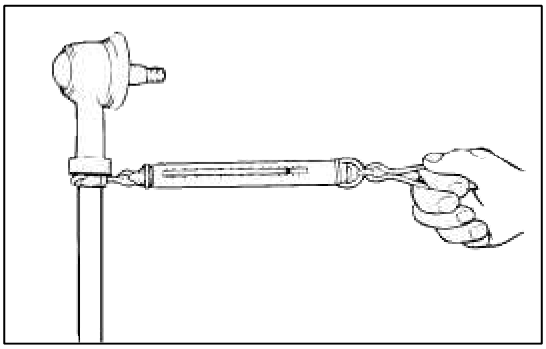


2. If the measured value is out of specifications, first adjust the yoke plug, then recheck the total pinion preload.
3. If you adjust the yoke plug but do not obtain the total pinion preload, check or replace the yoke plug components.

TIE ROD SWING RESISTANCE

1. Rotate the tie rod severely ten times.
2. Measure the tie rod swing resistance with a spring scale.

Standard value
2~5 Nm (20~50 kg·cm, 1.4~3.6 lb·ft)



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3. If the measured value exceeds the standard value, replace the tie rod assembly.

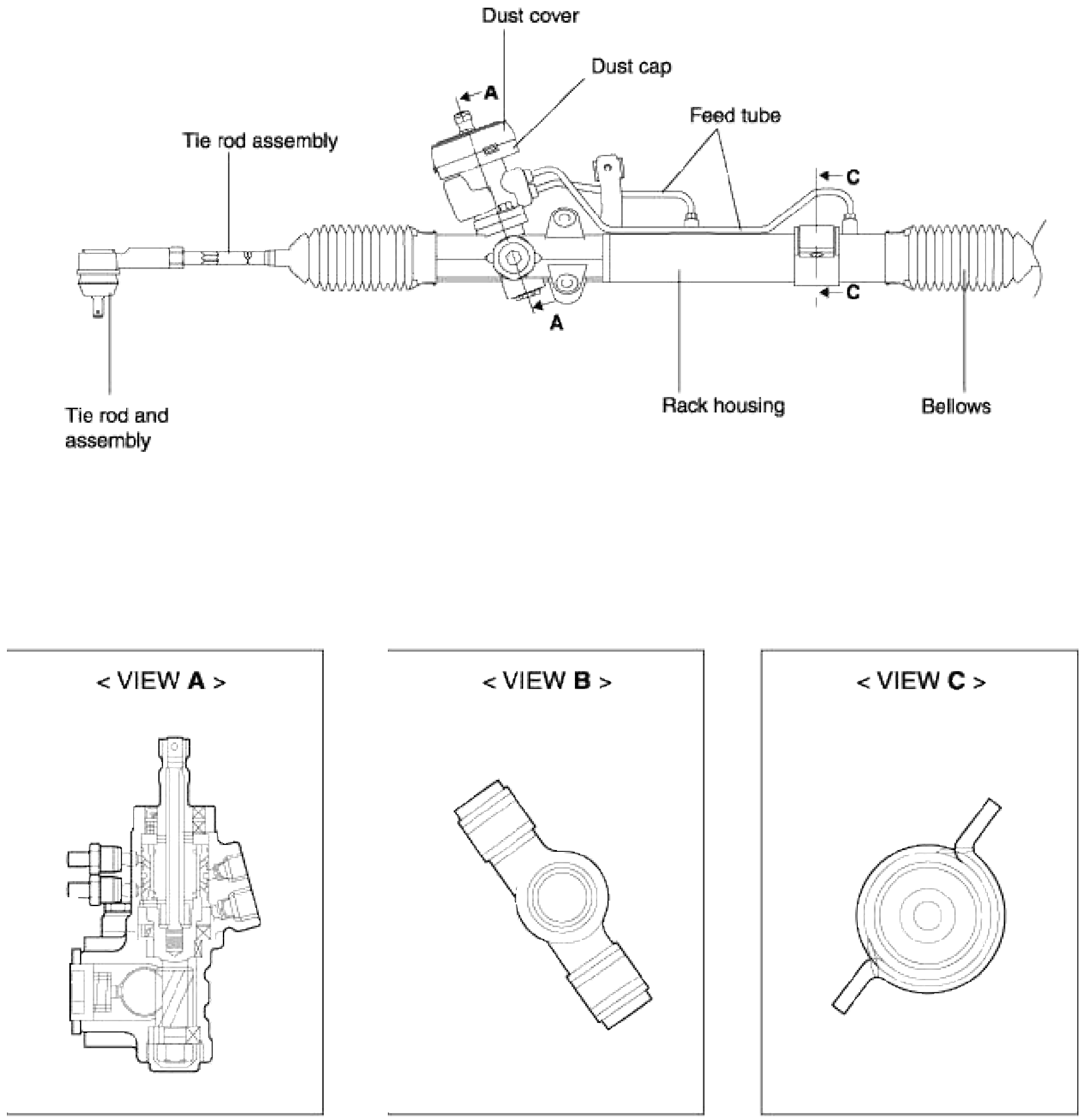
> **CAUTION**
>
> Even if the measured value is below the standard value, the tie rod that swings smoothly without excessive play may be used. If the measured value is below 0.44 kg·cm, replace the tie rod.

BELLOWS INSPECTION

1. Inspect the bellows for damage or deterioration.
2. Make sure the bellows are secured in the correct position.
3. If the bellows are defective, replace them with new ones.

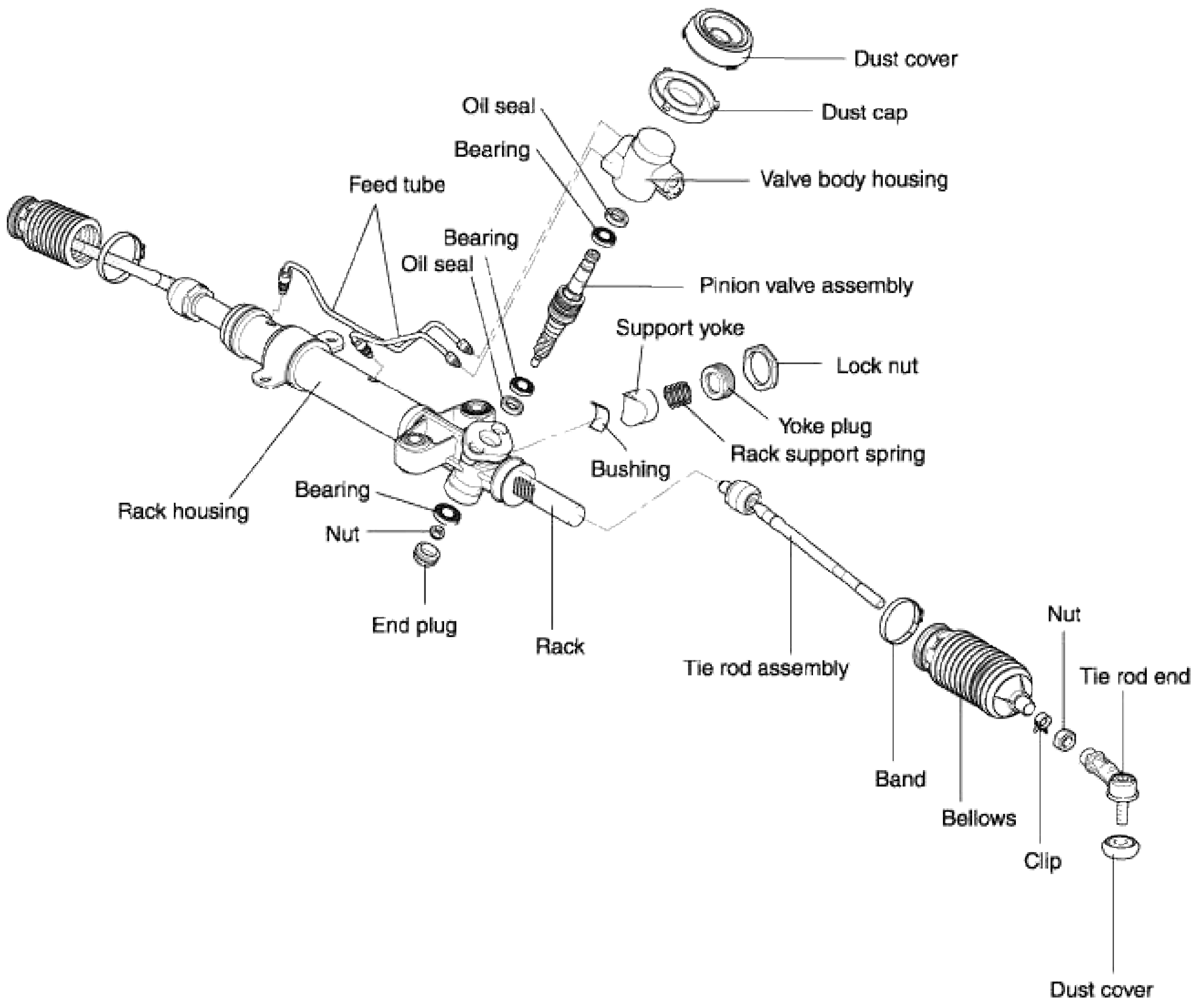
Steering System > Hydraulic Power Steering System > Power Steering Gear Box > Components and Components Location

COMPONENTS


Dust cover
Dust cap
A
Feed tube
Tie rod assembly
C
C
A
Tie rod and assembly
Rack housing
Bellows
< VIEW A >
< VIEW B >
< VIEW C >

COMPONENTS

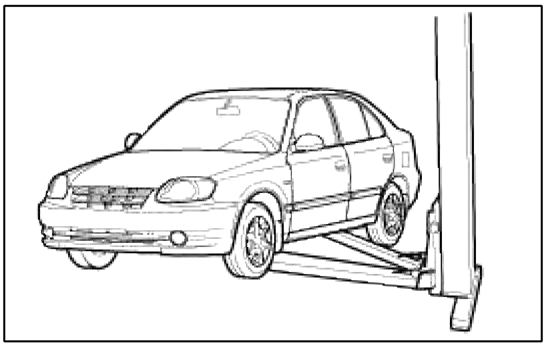
tomsn048@gmail.com


Dust cover
Dust cap
Oil seal
Bearing
Valve body housing
Feed tube
Bearing
Oil seal
Pinion valve assembly
Support yoke
Lock nut
Yoke plug
Rack support spring
Bushing
Rack housing
Bearing
Nut
End plug
Rack
Tie rod assembly
Nut
Tie rod end
Band
Bellows
Clip
Dust cover

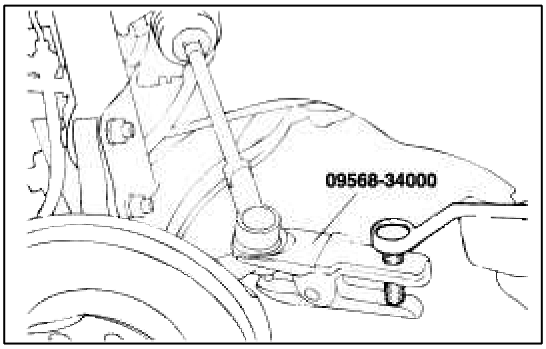
Steering System > Hydraulic Power Steering System > Power Steering Gear Box > Repair procedures

REMOVAL

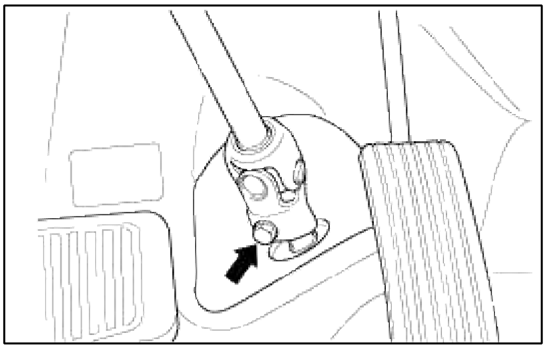
1. Support the specified portion of the vehicle with a lift.



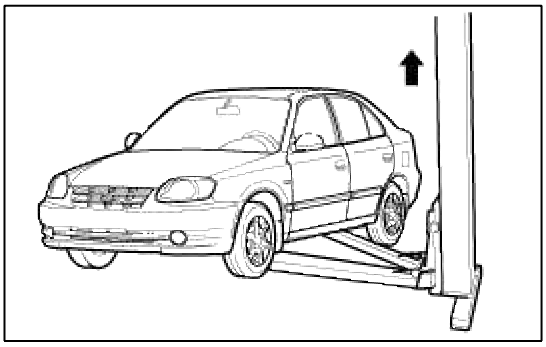
2. Drain the power steering fluid.
3. Remove the front tires (RH/LH).
4. After removing the split pin, disconnect the tie rod from the knuckle by using the special tool.



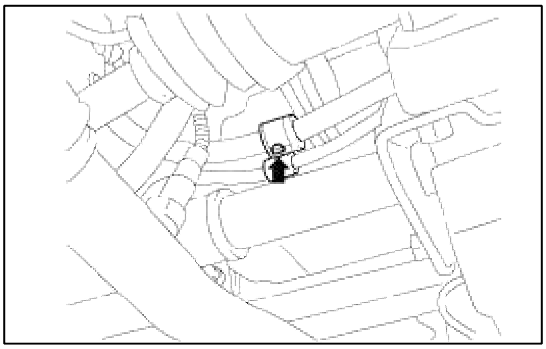
5. Disconnect the steering shaft assembly from the gear box inside the passenger compartment.



6. Raise up the vehicle.



7. Loosen the power steering pressure tube mounting clamp and return tube mounting clamp mounting bolt.



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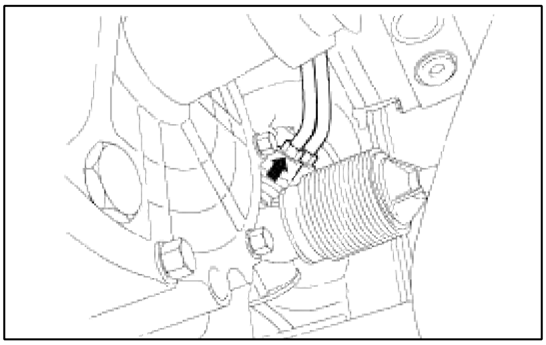
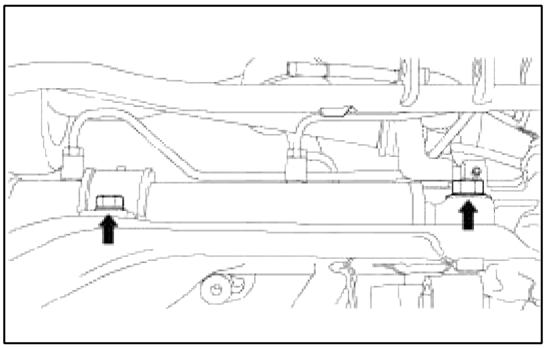
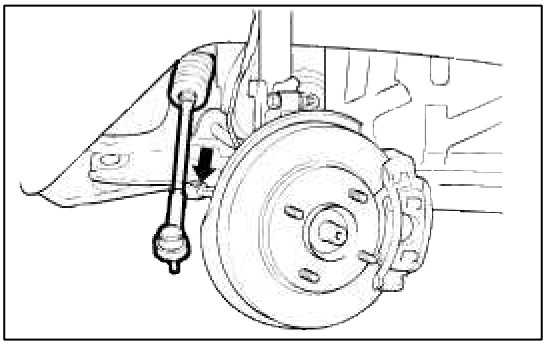
8. Disconnect the pressure tube and return tube fitting from the power steering gear box.



9. Remove the power steering gear box mounting bolt and clamp.

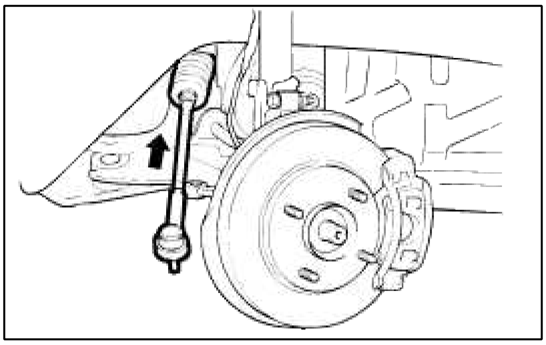


10. Separate the power steering gear box assembly by pulling it toward the rights side of the vehicle.

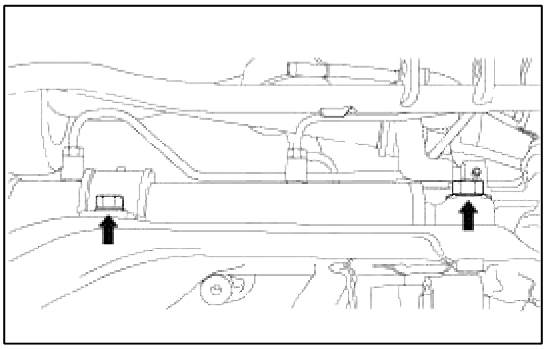


INSTALLATION

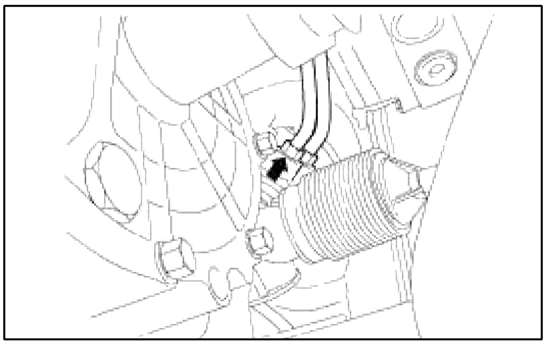
1. Push in the power steering gear box assembly in the right side of the vehicle.



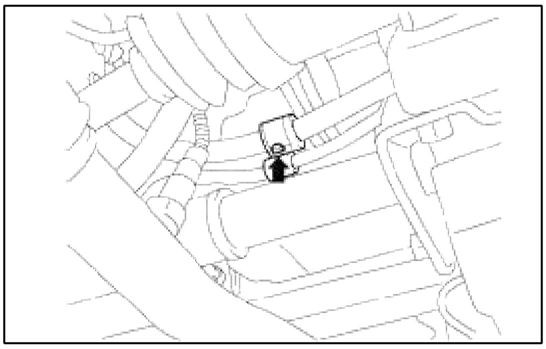
2. Fix the power steering gear box to the crossmember.



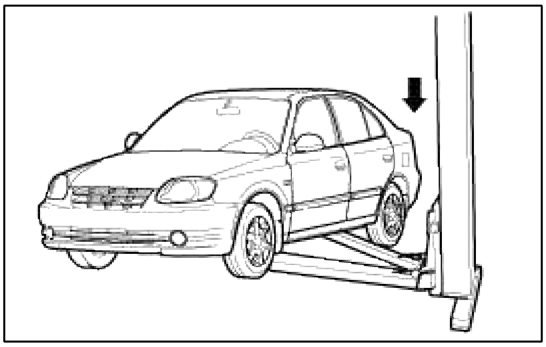
3. Install the pressure tube and return tube fitting to the power steering gear box.



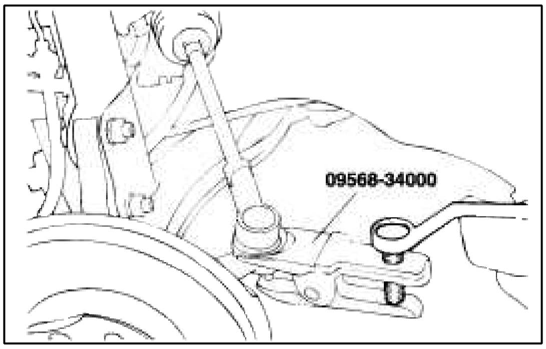
4. Fix the power steering pressure hose and return tube mounting clamp with the bolt.



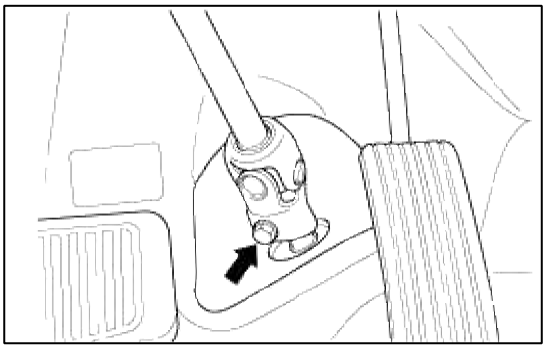
5. Slowly lower the vehicle.



6. Connect the tie rod to the knuckles (RH/LH)



7. Install the tires (RH/LH)
8. Connect the steering shaft to the driver side gear box.



9. Apply the power steering fluid.

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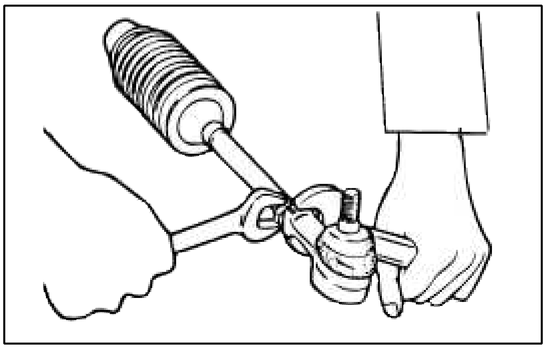
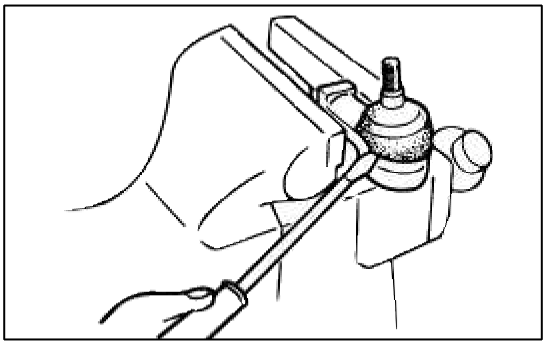
10. Bleed the air.

DISASSEMBLY

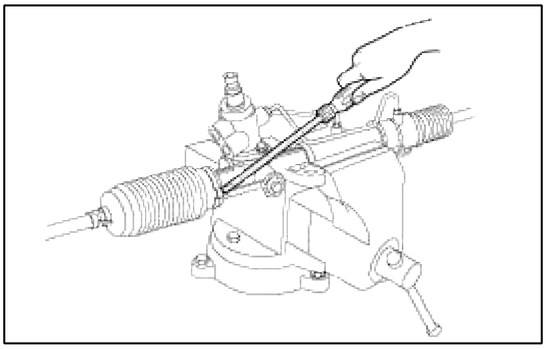
1. Remove the tie rod end from the tie rod.



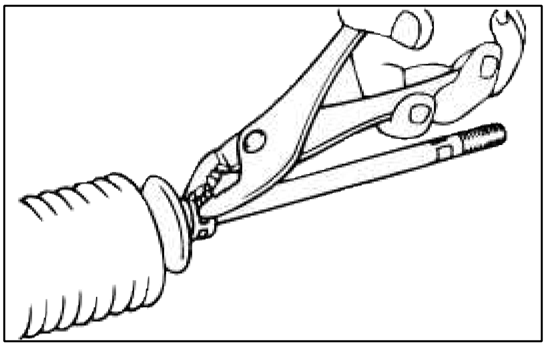
2. After mounting the tie rod end in a vise, remove the dust cover from the ball joint.



3. Remove the bellows band.



4. Remove the bellows clip.



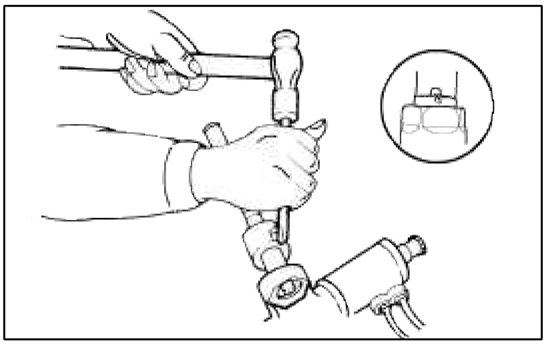
5. Pull the bellows out toward the tie rod.

NOTE

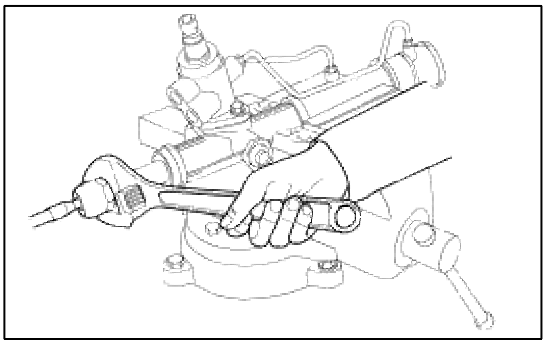
Check for rust on the rack when the bellows are replaced.

6. While moving the rack slowly, drain the fluid from the rack housing.

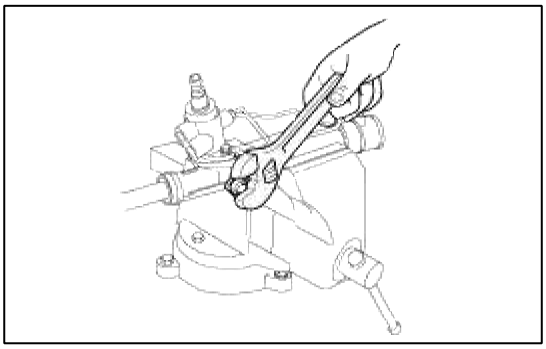
7. Unstake the tab washer which fixes the tie rod and rack with a chisel.



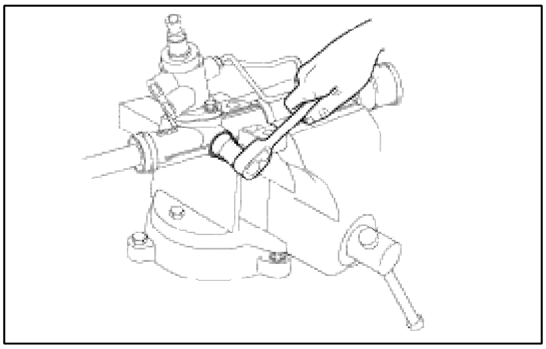
8. Remove the tie rod from the rack.

> **CAUTION**
>
> Remove the tie rod from the rack, taking care not to twist the rack.
>
> 

9. Remove the yoke plug lock nut.



10. Remove the yoke plug with a 14mm socket.



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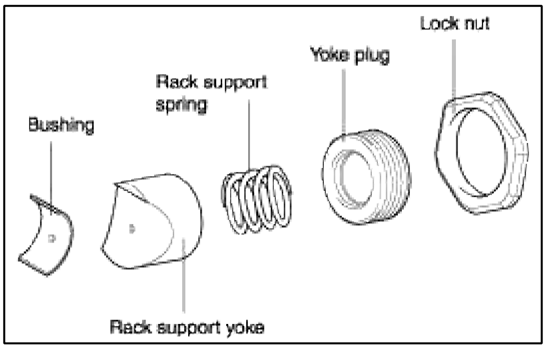
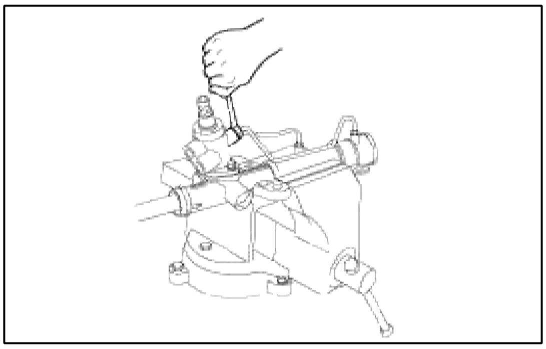
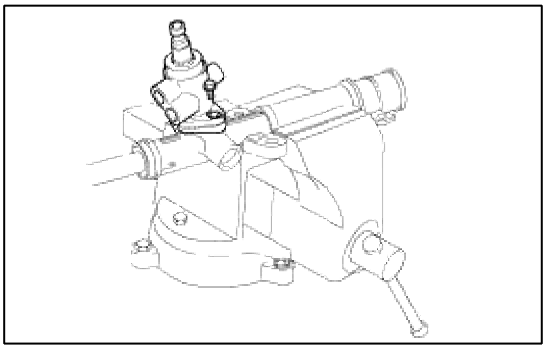
11. Remove the lock nut, yoke plug, rack support spring, rack support yoke and bushing from the gear box.


Lock nut
Yoke plug
Rack support spring
Bushing
Rack support yoke

12. Remove the feed tube from the rack housing.



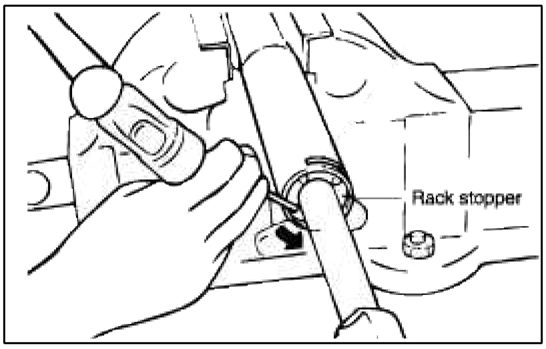
13. Remove the valve body housing by loosening the two bolts.



14. When the end of the circlip comes out of the notched hole of the housing rack cylinder, turn the rack stopper counterclockwise and remove the circlip.

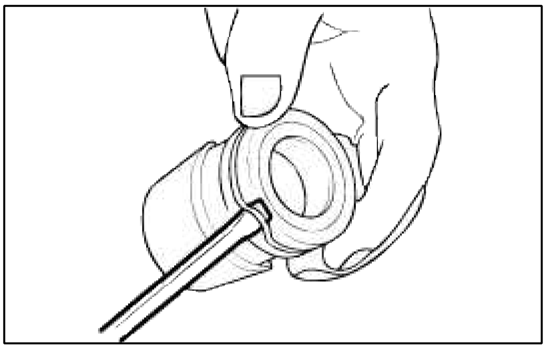
CAUTION

Be careful not to damage the rack.

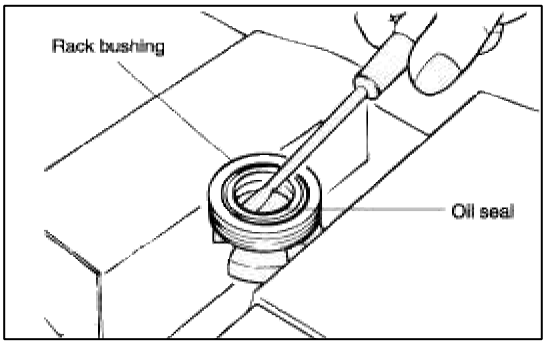

Rack stopper

15. Remove the rack bushing and rack from the rack housing.

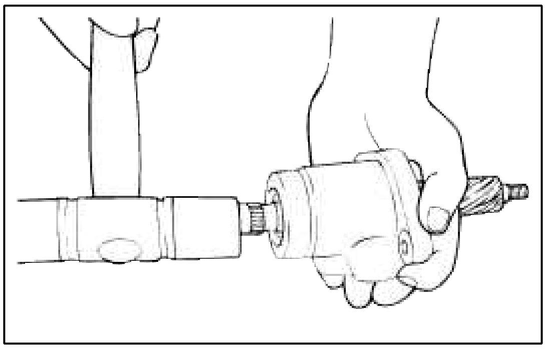
16. Remove the O-ring from the rack bushing.



17. Remove the oil seal from the rack bushing.


Rack bushing
Oil seal

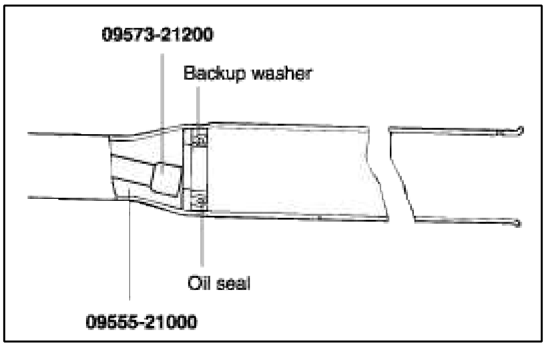
18. Remove the valve body from the valve body housing with a soft hammer.



19. Remove the oil seal and ball bearing from the valve body housing.
20. Remove the oil seal and O-ring from the rack housing.

> **CAUTION**
>
> Be careful not to damage the pinion valve cylinder bore of the rack housing.

21. Using the special tool, remove the oil seal and ball bearing from the valve body housing.


09573-21200
Backup washer
Oil seal
09555-21000

INSPECTION AND ADJUSTMENT BEFORE DISASSEMBLY

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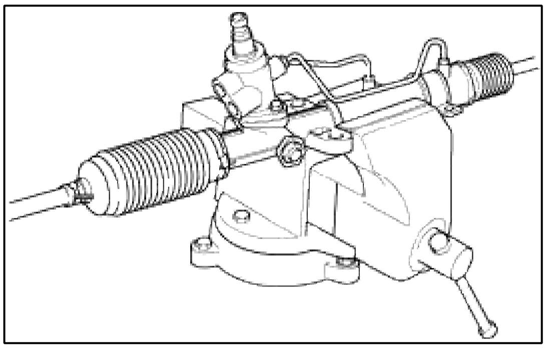
CAUTION

When mounting the gear box in a vise, let the installation section of it be fixed to the jaws. If other section is fixed, the gear box may be damaged.



TOTAL PINION PRELOAD

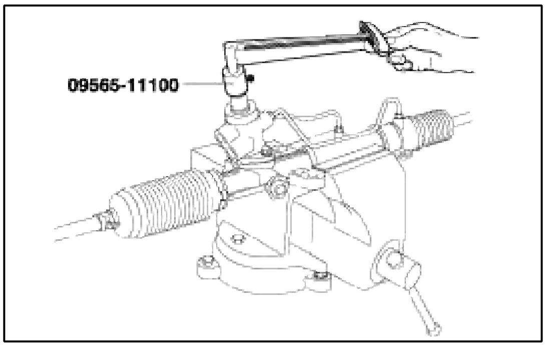
1. Rotate the pinion gear for approximately 4 to 6 seconds for one rotation to measure the total pinion preload.

Standard value

0.6~1.3 Nm (6~13 kg·cm, 0.4~1.0 lb·ft)

NOTE

Measure the pinion preload through the entire stroke of the rack.



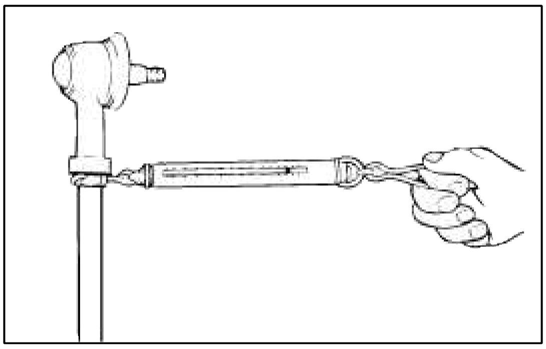
2. If the measured value is out of specifications, first adjust the yoke plug, then recheck the total pinion preload.
3. If not obtain the total pinion preload after adjusting the yoke plug check or replace the yoke plug components.

TIE ROD SWING RESISTANCE

1. Rotate the tie rod severely ten times.
2. Measure the tie rod swing resistance with a spring scale.

Standard value

2~5 Nm (20~50 kg·cm, 1.4~3.6 lb·ft)



3. If the measured value exceeds the standard value, replace the tie rod assembly.

> **CAUTION**
>
> Even if the measured value is below the standard value, the tie rod that swings smoothly without excessive play may be used. If the measured value is below 0.44 kg·cm, replace the tie rod.

BELLOWS INSPECTION

1. Inspect the bellows for damage or deterioration.
2. Make sure the bellows are secured in the correct position.
3. If the bellows are defective, replace them with new ones.

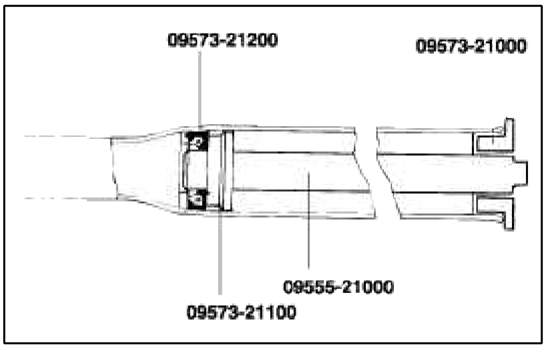
REASSEMBLY

1. Apply the specified fluid to the entire surface of the rack oil seal.

Recommended fluid : PSF-3

---

2. Install the oil seal to the specified position in the rack housing.

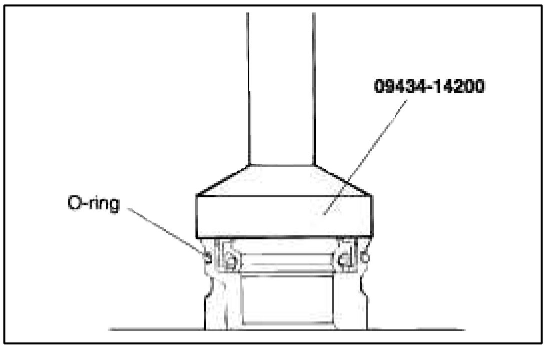


3. Apply the specified fluid to the entire surface of the rack bushing oil seal.

Recommended fluid : PSF-3

---

4. Install the oil seal in the rack bushing.



5. Apply the specified fluid to the entire surface of the O-ring and install it in the rack bushing.

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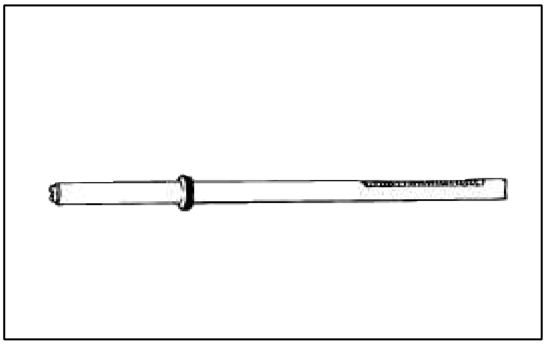
6. Apply the specified grease to the rack teeth.

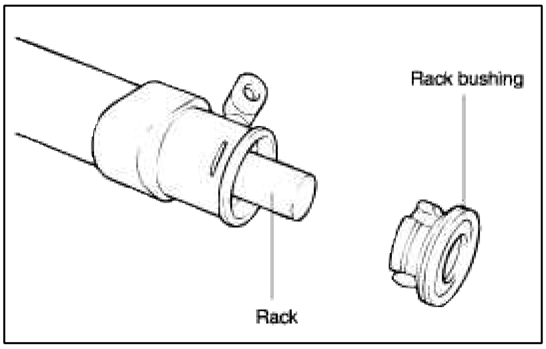
Recommended grease :
Multipurpose grease SAE J310a, NLGI #2 EP

NOTE

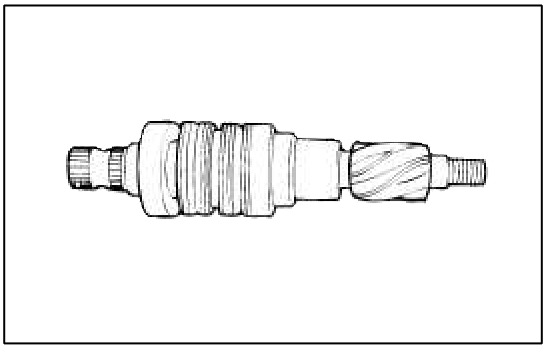
Do not plug the vent hole in the rack with grease.



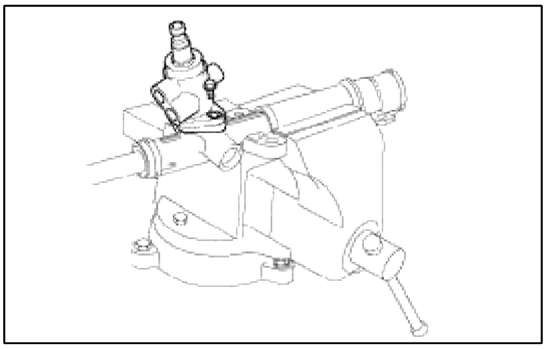
7. Insert the rack into the rack housing and push in the rack bushing until it is aligned with the notched hole of the rack housing, then install it.



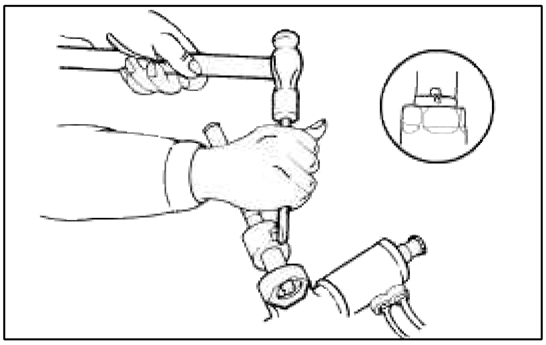
8. Using a special tool, install the oil seal and the ball bearing in the valve body housing.
9. After applying the specified fluid and grease to the pinion valve assembly, install it in the rack housing assembly.



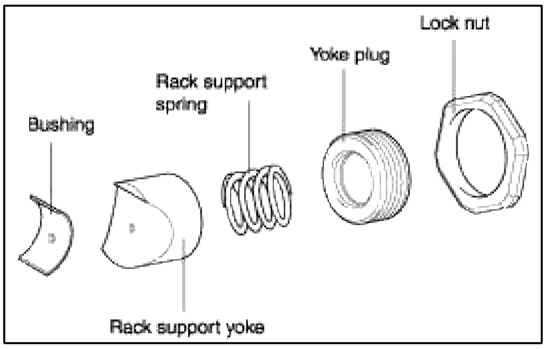
10. After applying the specified fluid to the oil seal, install it in the rack housing, and fix the valve body assembly and O-ring in the gear box.



11. Install the tie rod and punch on a point over the tie rod with a chisel.



12. Install the bushing, rack support yoke, rack support spring and yoke plug in the order shown in the illustration. Apply semi-drying sealant to the threaded section of the yoke plug before installation.



13. With the rack placed in the center position, attach the yoke plug to the rack housing. Tighten the yoke plug to 12 Nm (120 kg·cm, 8.9 lb·ft), with a 14mm socket. Loosen the yoke plug approximately from 30° to 60° and tighten the yoke nut to the specified torque.

Tightening torque
50~70 Nm (500~700 kg·cm, 37~52 lb·ft)

14. Tighten the feed tube to the specified torque and install the mounting rubber using adhesive.
15. Apply the specified grease to the bellows mounting position (fitting groove) of the tie rod.

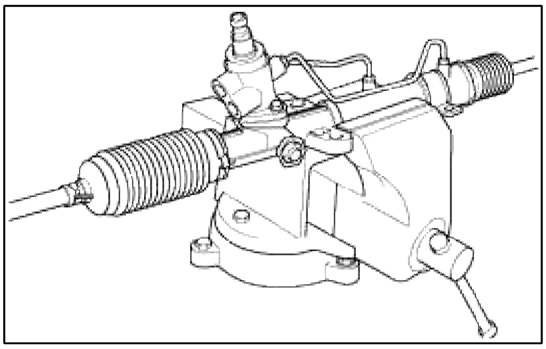
Recommended grease : Silicone grease

16. Install the new attaching band to the bellows.

NOTE

When the bellows are installed, a new band must be used.

17. Install the bellows in position, taking care not to twist it.



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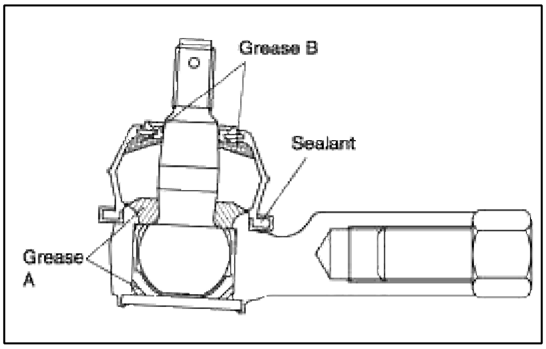
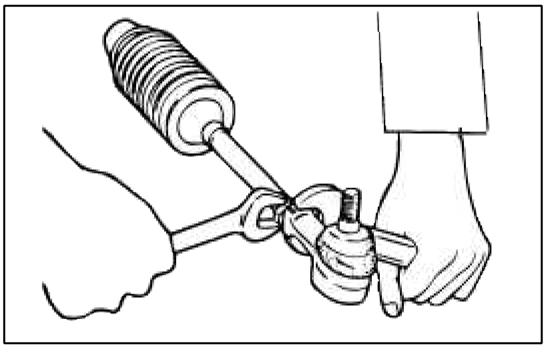
18. Fill the dust cover inner side and lip with the specified grease, and fix the dust cover in position with the clip ring attached in the groove of the tie rod end.

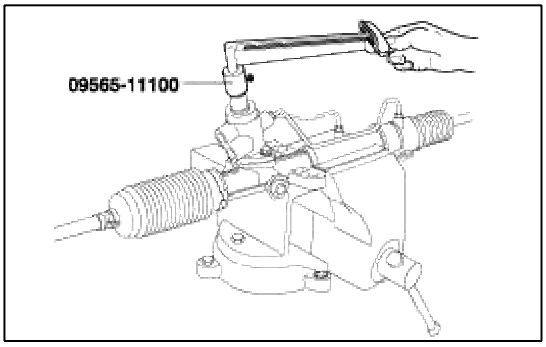
Recommended grease
A : POLY LUB GLY 801K or equivalent
B : SHOWA SUNLIGHT MB2 or equivalent
Dust cover inner side and lip : THREE BOND



19. Install the tie rod to the tie rod end.



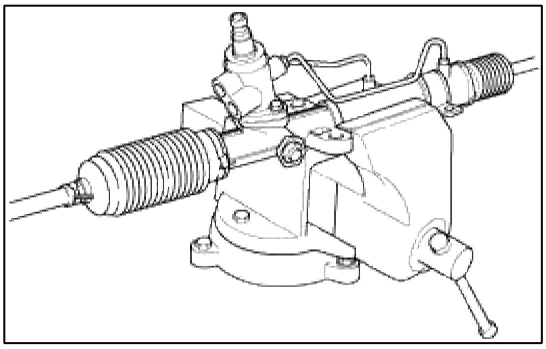
20. Check for total pinion preload.



INSPECTION AND ADJUSTMENT BEFORE DISASSEMBLY

CAUTION

When mounting the gear box in a vise, let the installation section of it be fixed to the jaws. If other section is fixed, the gear box may be damaged.



TOTAL PINION PRELOAD

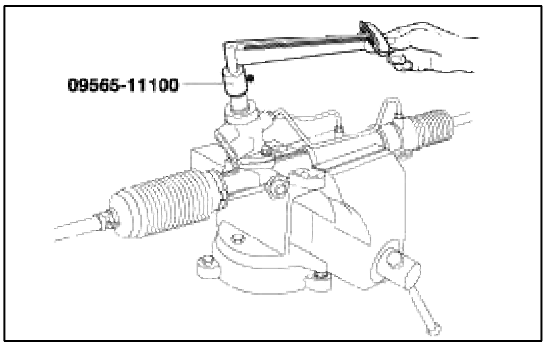
1. Rotate the pinion gear for approximately 4 to 6 seconds for one rotation to measure the total pinion preload.

Standard value

0.6~1.3 Nm (6~13 kg·cm, 0.4~1.0 lb·ft)

NOTE

Measure the pinion preload through the entire stroke of the rack.



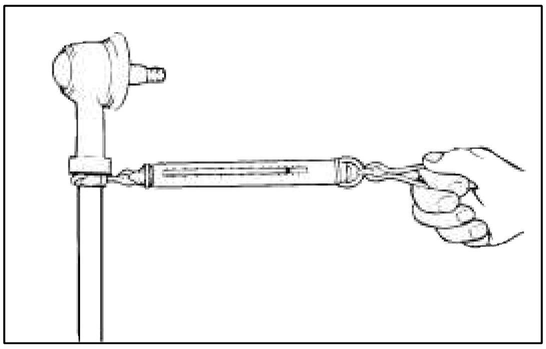
2. If the measured value is out of specifications, first adjust the yoke plug, then recheck the total pinion preload.
3. If not obtain the total pinion preload after adjusting the yoke plug check or replace the yoke plug components.

TIE ROD SWING RESISTANCE

1. Rotate the tie rod severely ten times.
2. Measure the tie rod swing resistance with a spring scale.

Standard value

2~5 Nm (20~50 kg·cm, 1.4~3.6 lb·ft)



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3. If the measured value exceeds the standard value, replace the tie rod assembly.

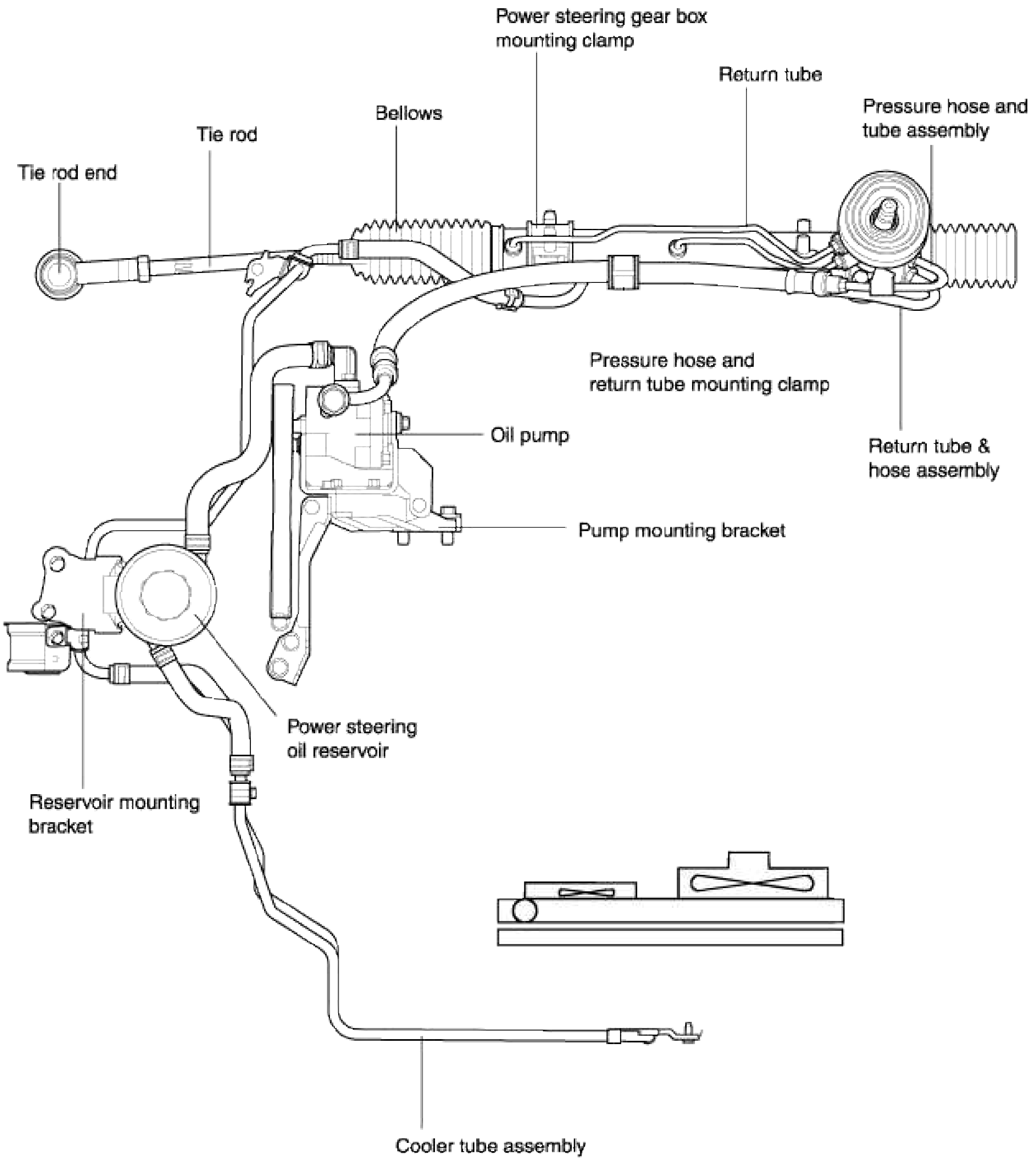
> **CAUTION**
>
> Even if the measured value is below the standard value, the tie rod that swings smoothly without excessive play may be used. If the measured value is below 0.44 kg·cm, replace the tie rod.

BELLOWS INSPECTION

1. Inspect the bellows for damage or deterioration.
2. Make sure the bellows are secured in the correct position.
3. If the bellows are defective, replace them with new ones.

Steering System > Hydraulic Power Steering System > Power Steering Hoses > Components and Components Location

COMPONENTS


Power steering gear box mounting clamp
Return tube
Pressure hose and tube assembly
Bellows
Tie rod
Tie rod end
Pressure hose and return tube mounting clamp
Oil pump
Return tube & hose assembly
Pump mounting bracket
Power steering oil reservoir
Reservoir mounting bracket
Cooler tube assembly

Steering System > Hydraulic Power Steering System > Power Steering Hoses > Repair procedures

REMOVAL

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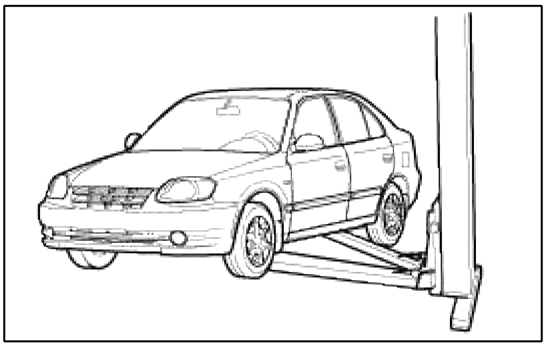
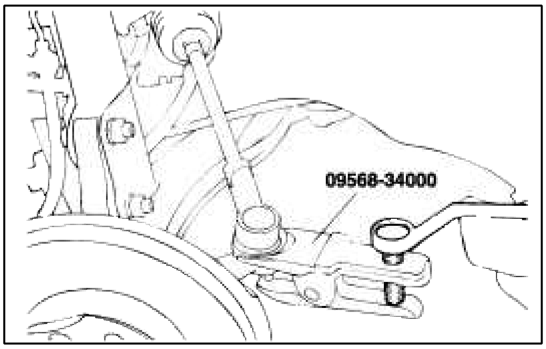
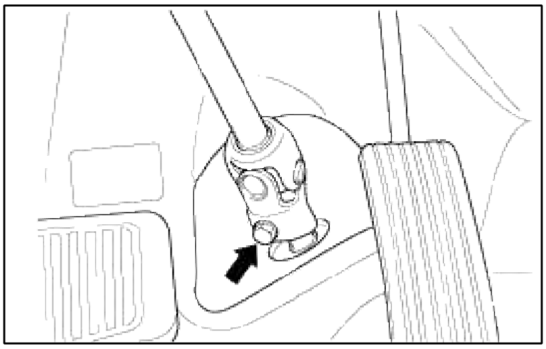
1. Support the specified point of the vehicle with a lift.



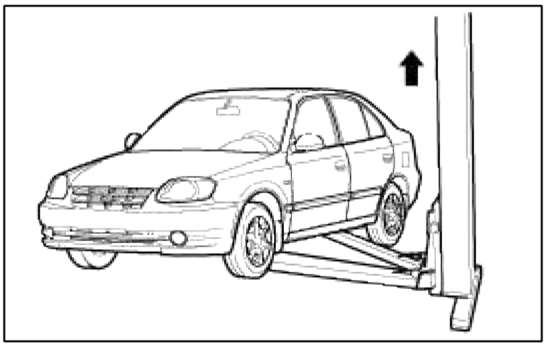
2. Drain the power steering fluid.
3. Remove the front tires (RH/LH).
4. After removing the split pin, disconnect the tie rod from the knuckle using a special tool (09568-34000).



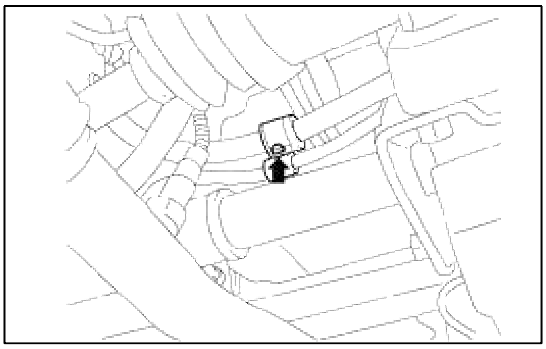
5. Disconnect the shaft assembly from the gear box inside the passenger compartment.



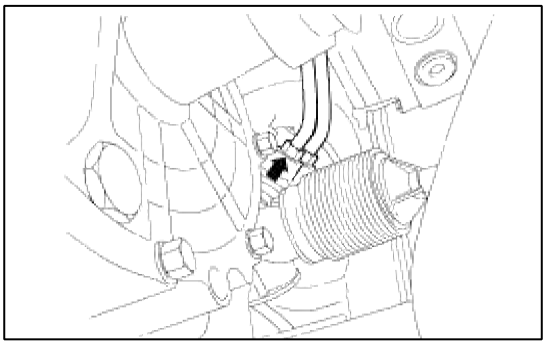
6. Raise up the vehicle.



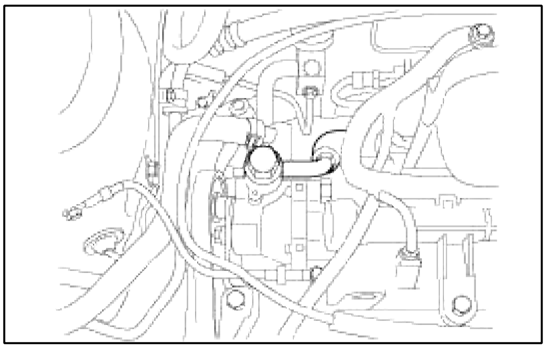
7. Loosen the power steering pressure tube mounting clamp and return tube mounting clamp mounting bolt.



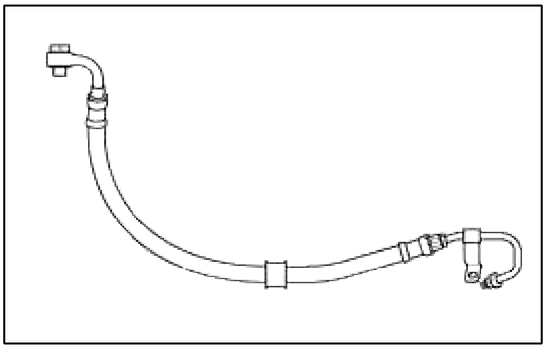
8. Disconnect the pressure tube and return tube fitting from the power steering gear box.



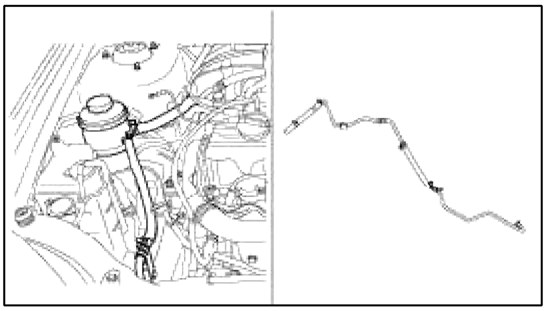
9. Lower the vehicle and disconnect the pressure hose connector from the oil pump. (When removing the pressure hose)



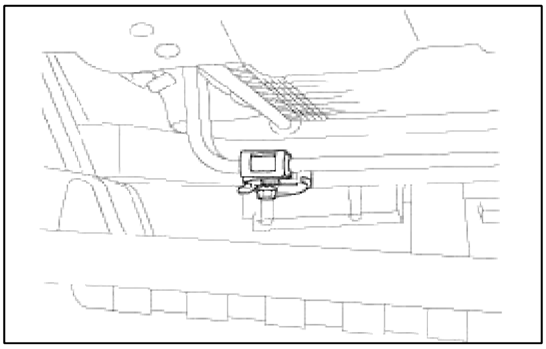
10. Disconnect the pressure hose assembly. (When removing the pressure hose)



11. After removing the clip from the color tube, removing the return tube and hose. (When removing the return tube and hose)



12. Remove the 10mm color tube mounting clip bolt. (When removing the color tube)



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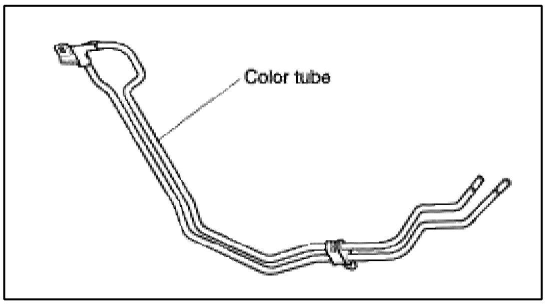
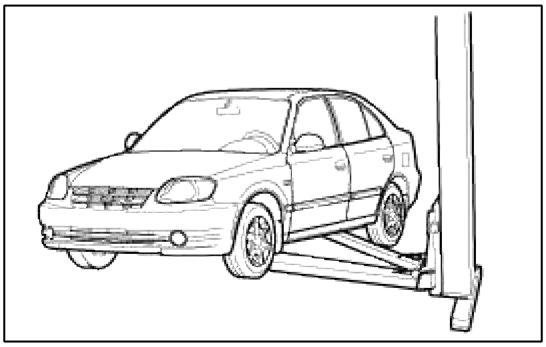
13. Disconnect the remove the color tube from the power steering oil reservoir tank side hose. (When working on the color tube)

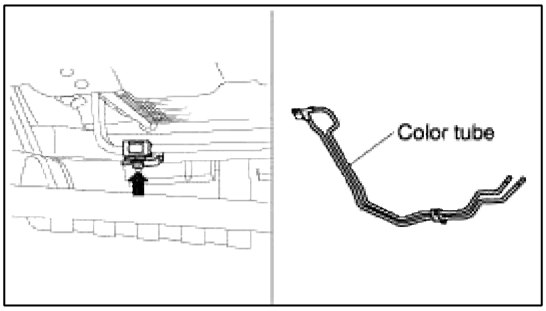


INSTALLATION

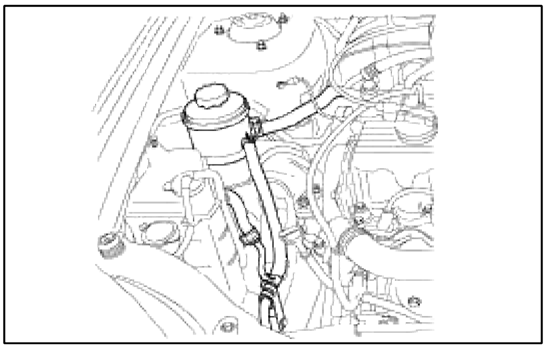
1. Support the specified portion of the vehicle with a lift.



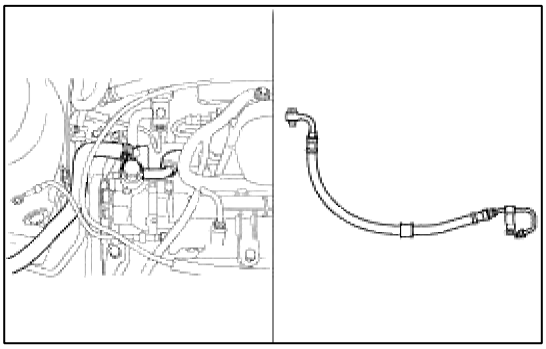
2. Insert the color tube from the front pump upper part to the lower part and install 2 mounting bolts.



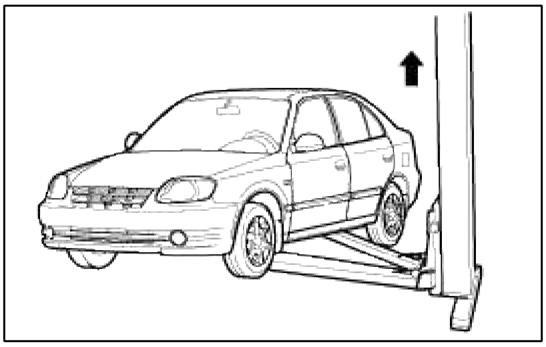
3. Connect the color tube to the power steering oil reservoir tank side hose, return tube and hose side and fix it with clips. (When installing the color tube)



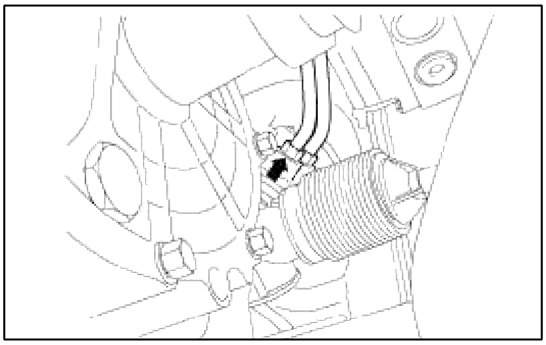
4. Place the pressure hose and tube assembly in position and connect it to the oil pump. (When installing the pressure hose and tube)



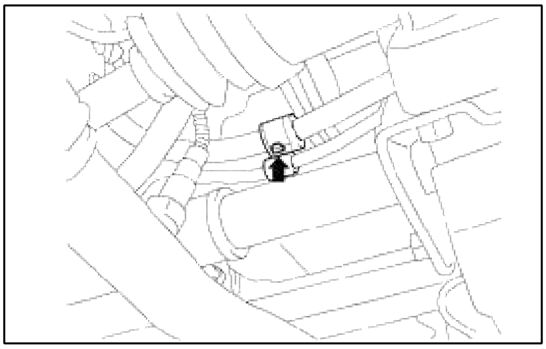
5. Raise the vehicle with a lift.



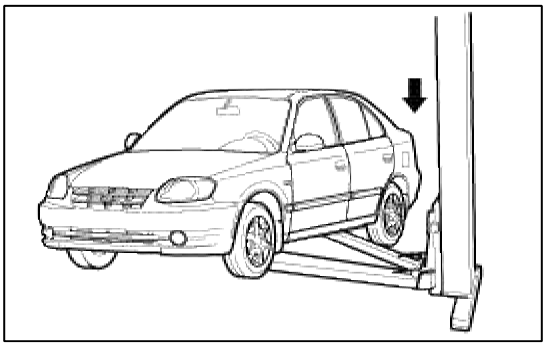
6. Fix the pressure tube and return tube fitting to the power steering gear box.



7. Fix the power steering pressure tube and return tube mounting clamp with a bolt.



8. Lower the vehicle.



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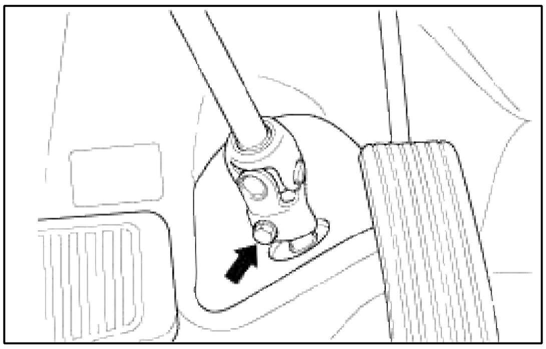
9. Connect the gear box and steering column shaft universal joint in the passenger compartment.



10. Connect the tie rod end to the LH/RH knuckles.
11. Install the tires (LH/RH).
12. Fill the power steering oil reservoir with fluid.

INSPECTION

1. Twisting the hose by hand, check for cracks.
2. Check that the hose does not contact with other components.

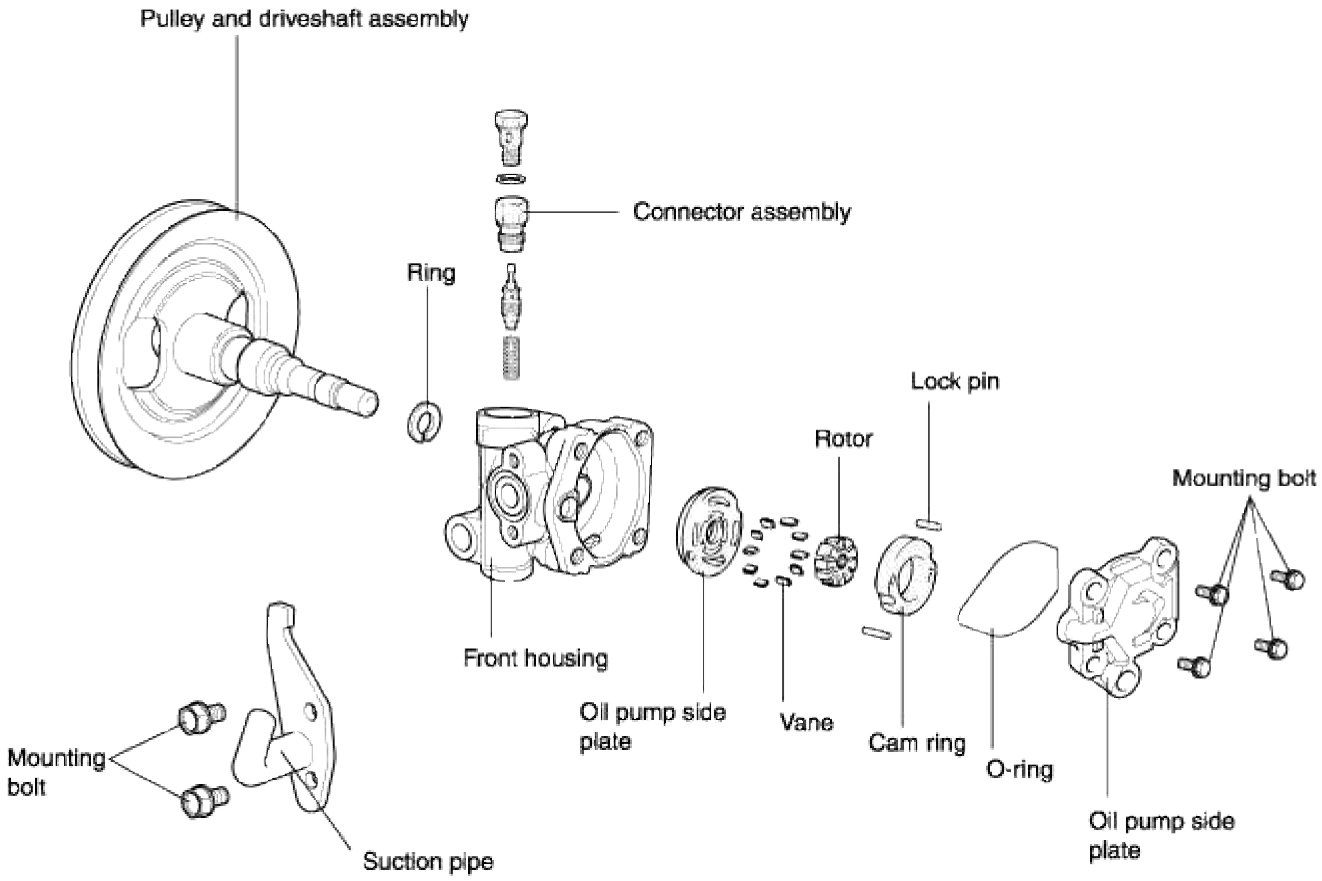
HOW TO FILL WITH POWER STEERING FLUID

1. Fill the power steering reservoir with the power steering fluid to the "Max." position
2. Lift the front wheels with a jack and turn the steering wheel fully to the left and right 5~6 times at 13 rpm, while driving the pulley only by operating the start motor.
3. Start the engine, let it idle and turn the steering wheel fully left and right several times until bubbles disappear from the power steering reservoir.
4. If the oil color does not become milk-white and the oil level is constant at the "MAX" position, fluid level is O.K.

> **CAUTION**
>
> If the oil level changes when turning the steering wheel, and the oil overflows when stopping the engine, it shows that air bleeding wasn't performed perfectly. As it can cause noise and early damage, you must repeat the above procedures.

Steering System > Hydraulic Power Steering System > Power Steering Oil Pump > Components and Components Location

COMPONENTS


Pulley and driveshaft assembly
Connector assembly
Ring
Lock pin
Rotor
Mounting bolt
Front housing
Oil pump side plate
Vane
Cam ring
O-ring
Oil pump side plate
Mounting bolt
Suction pipe

Steering System > Hydraulic Power Steering System > Power Steering Oil Pump > Repair procedures

REMOVAL

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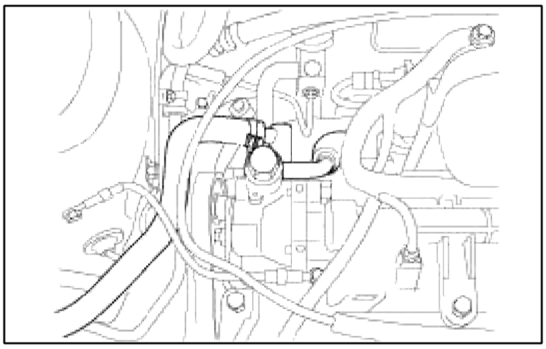
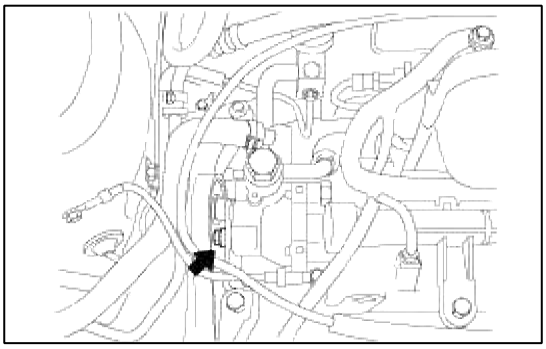
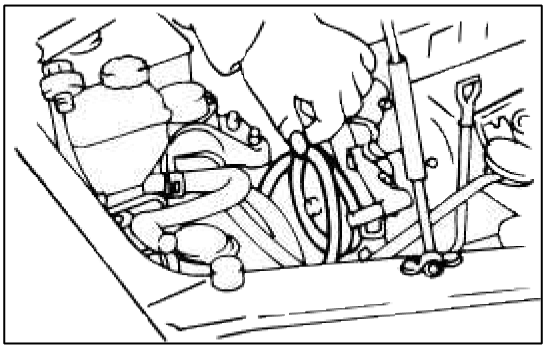
1. Remove the pressure hose from the oil pump.
   Disconnect the suction hose from the suction pipe and drain the fluid into a container.



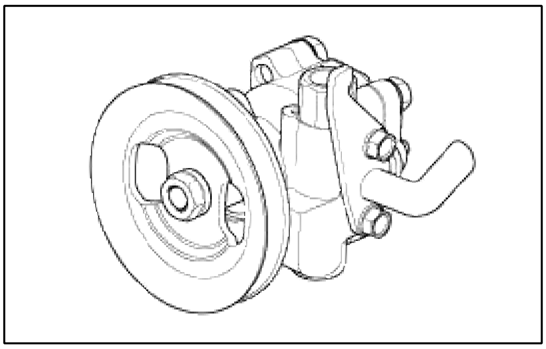
2. Loosen the power steering "V" belt tension adjusting bolt.



3. Remove the "V" belt from the power steering oil pump pulley.



4. After removing the power steering oil pump mounting bolts and the tension adjusting bolt, remove the power steering oil pump assembly.

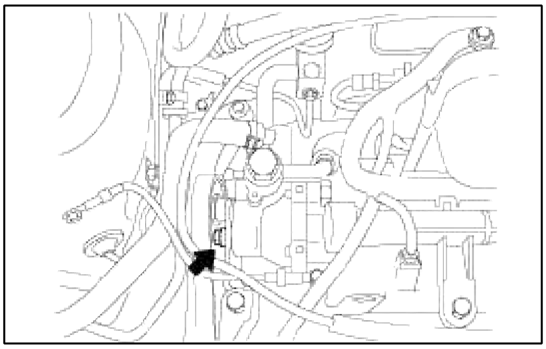


5. Remove the power steering oil pump mounting bracket.

INSTALLATION

1. After installing the oil pump to the oil pump bracket, install the "V" belt and tighten the bolt adjusting tension to the specified torque.

Standard value
Oil pump adjusting bolt:25~33 Nm (250~330 kg·cm, 18~24 lb·ft)



2. Install the suction hose.

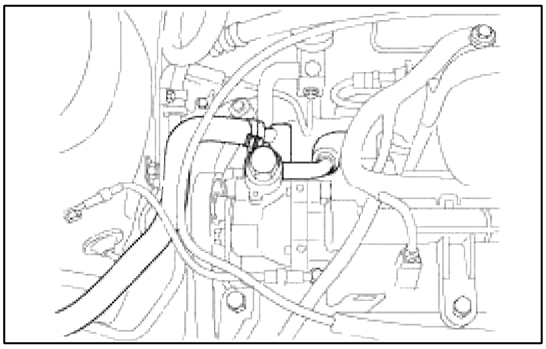
CAUTION

Install the pressure hose to the oil pump, facing the painted part on the hose toward the oil pump.

3. Install the pressure hose to the oil pump.

NOTE

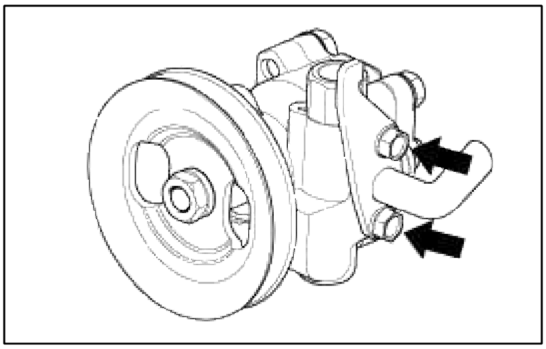
Install the pressure hose being careful so that it does not twist and come in contact with other components.



4. Add power steering fluid (PSF-3).
5. Air bleed the system.
6. Check the oil pump pressure.

DISASSEMBLY

1. After removing the 2 bolts(10mm), remove the suction pipe and the O-ring from the oil pump body.



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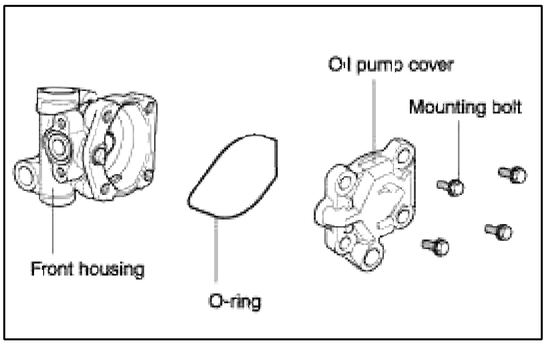
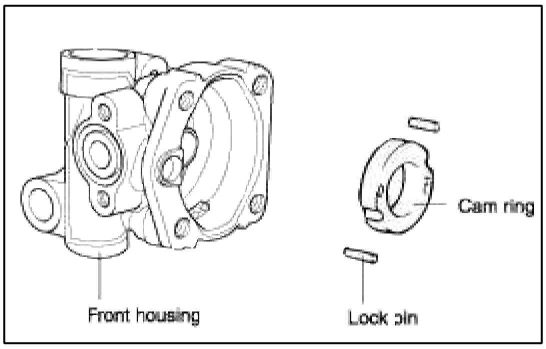
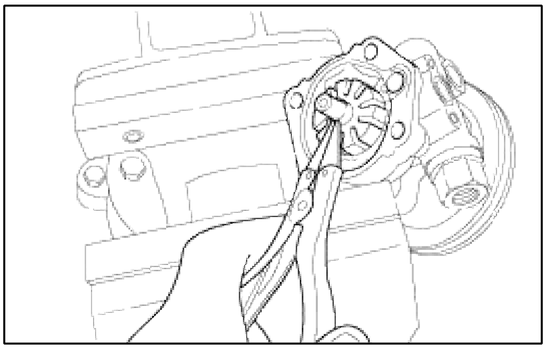
2. Loosen the four bolts(12mm) and remove the oil pump cover assembly.


Oil pump cover
Mounting bolt
Front housing
O-ring

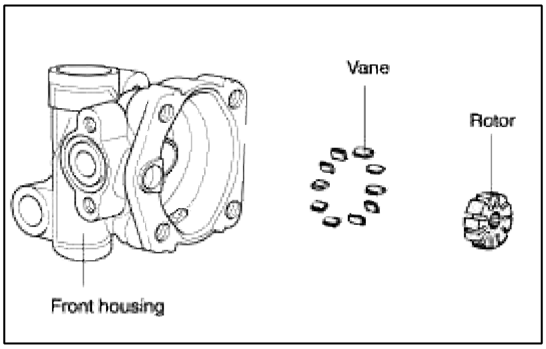
3. Remove the cam ring.


Cam ring
Front housing
Lock pin

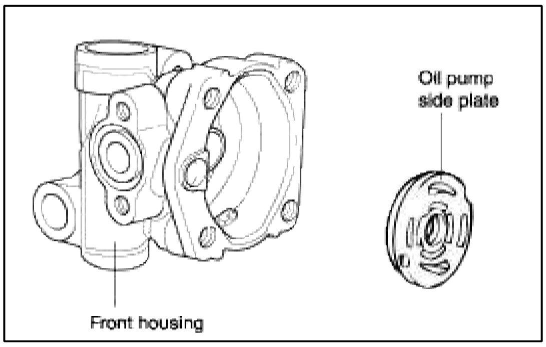
4. Remove the shaft fixing ring using snap ring pliers.



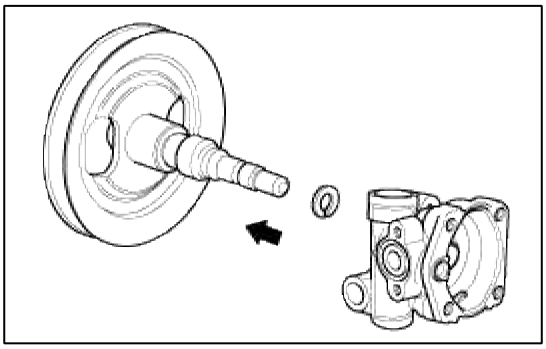
5. Remove the rotor and vanes.


Vane
Rotor
Front housing

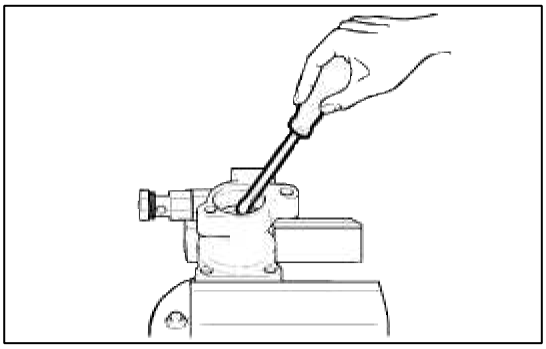
6. Remove the oil pump side plate.


Oil pump
side plate
Front housing

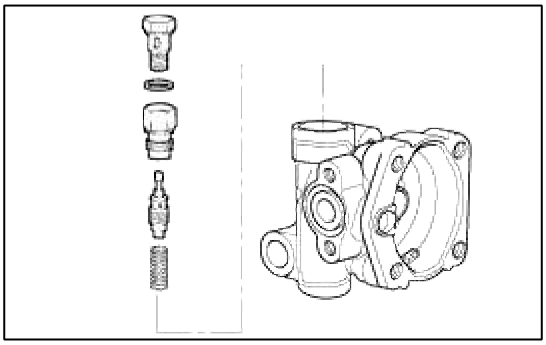
7. Remove the pulley and shaft assembly from the oil pump body.



8. Remove the oil seal from the oil pump body.



9. Remove the connector(24mm) from the oil pump body, and take out the flow control valve and the flow control spring.



10. Remove the O-ring from the connector.

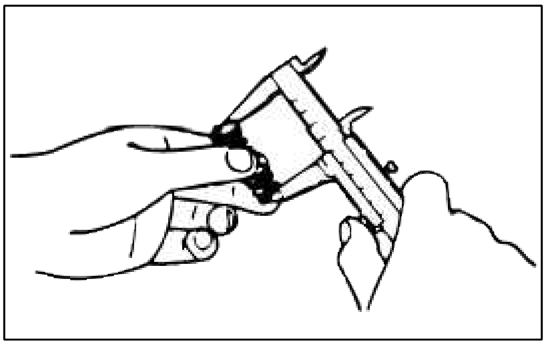
CAUTION

Do not disassemble the flow control valve.

INSPECTION

1. Check the free length of the flow control spring.

Free length of the flow control spring : 36.5mm



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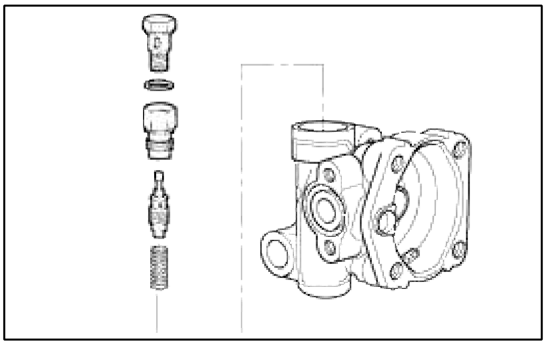
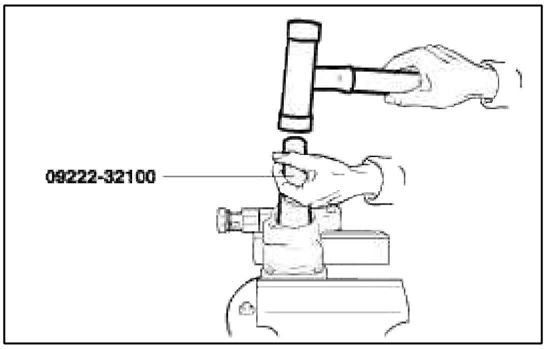
2. Check that the flow control valve is not bent.
3. Check the shaft for wear and damage.
4. Check the V-belt for wear and deterioration.
5. Check the grooves of the rotor and vanes for stratified abrasion.
6. Check the contact surface of the cam ring and vanes for stratified abrasion.
7. Check vanes for damage.
8. Check that there is no striped wear in the side plate or contacting part between the shaft and the pump cover surface.

REASSEMBLY

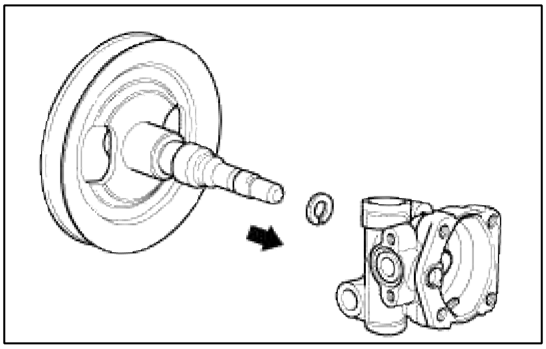
1. After installing the O-ring to the connector, install the flow control spring, the flow control valve and the connector into the pump body.



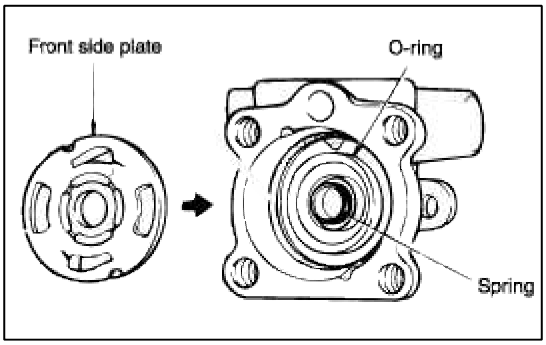
2. Install the oil seal in the pump body by using the special tool.



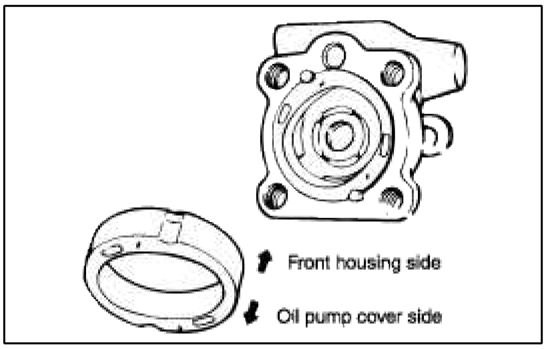
3. Install the pulley and shaft assembly to the oil pump body.



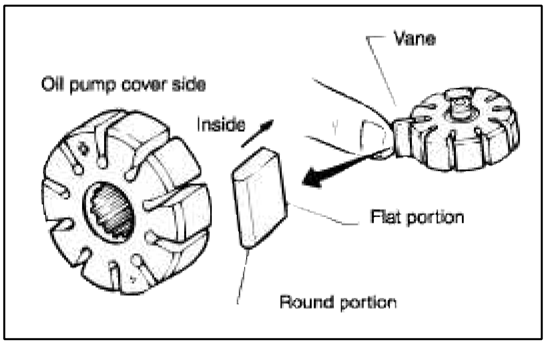
4. Install the oil pup side plate and rotor.



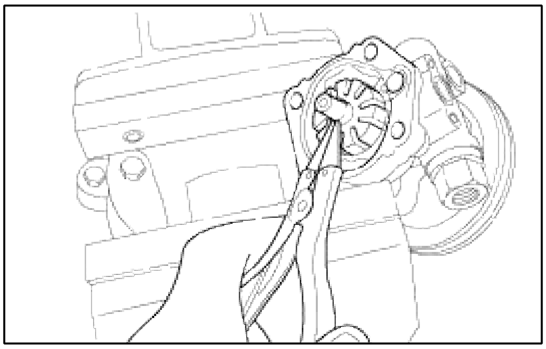
5. After inserting the lock pin into the groove of the front housing, install the cam ring attending to the direction.


Front housing side
Oil pump cover side

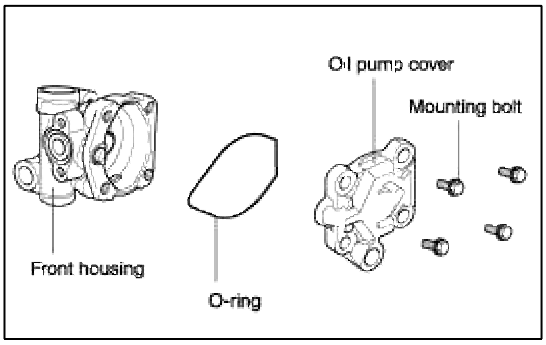
6. Install the rotor.
7. Install vanes so that the rounded edges face outward.


Vane
Oil pump cover side
Inside
Flat portion
Round portion

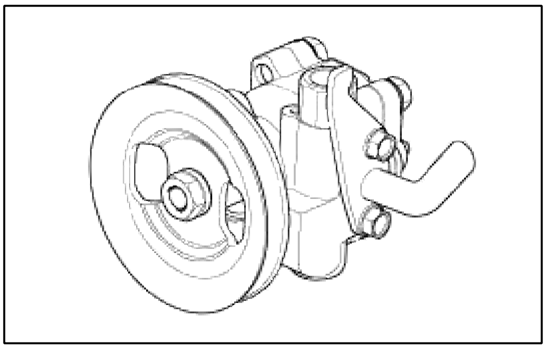
8. Install the shaft fixing clip with snap ring pliers.



9. Install the O-ring and oil pump cover assembly.


Oil pump cover
Mounting bolt
Front housing
O-ring

10. Install the suction pipe and O-ring.



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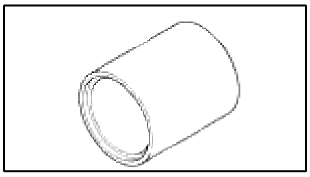
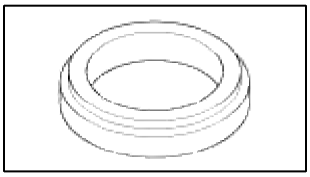
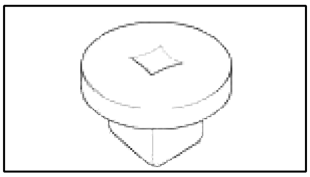
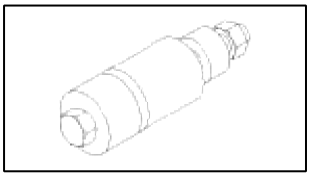
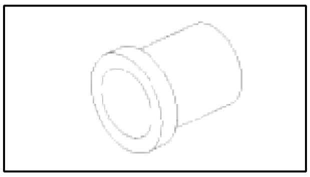
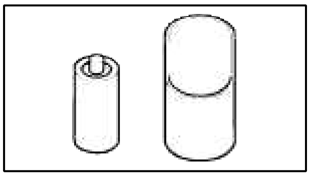
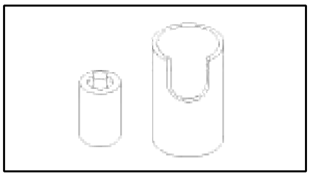
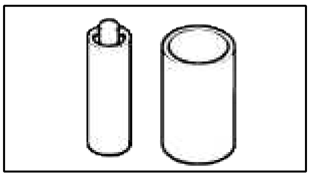
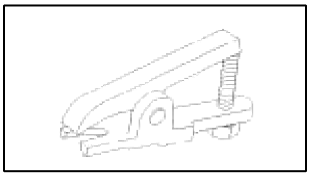
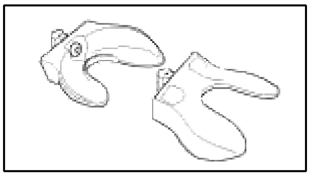
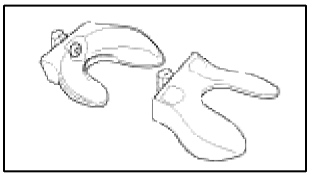
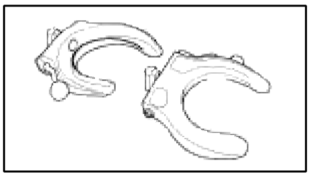
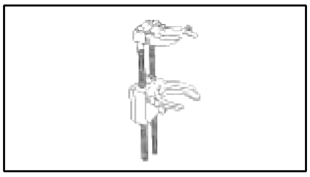
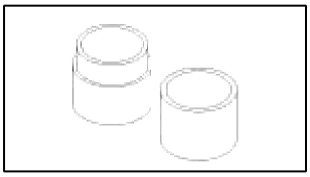
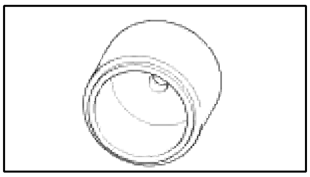
ACCENT(LC) > 2005 > G 1.5 SOHC > Suspension System

Suspension System > General Information > Special Service Tools

SPECIAL TOOLS

Tool (Number and Name)	Use	Illustration
09216-21100 Mount bushing remover		Removal & installation of lower arm bushing (G) (use with 09216-21200, 09545-02000)
09216-21200 Mount bushing remover and installer base		Removal & installation of the lower arm bushing (G) (use with 09216-21100, 09545-02000)
09532-11600 Preload socket		Measurement of the lower arm ball joint and stabilizer link starting torque
09545-02000 Lower arm bushing remover and installer		Installation of the lower arm ball joint
09545-21100 Ball joint dust cover installer		Installation of the lower arm ball joint snap ring
09545-25000 Lower arm bushing remover and installer		Removal & installation of the lower arm bushing (A)
09551-25000 Trailing arm bushing remover and installer		Removal & installation of the trailing arm bushing
09552-25000 Rear suspension arm remover and installer		Removal & installation of the rear suspension arm bushing
09568-34000 Ball joint puller		Separation of the lower arm ball joint

A-20 Strut compressor adapter		Compression of the rear coil spring (use with J38402)
A-42 Strut compressor adapter		Compression of the front coil spring (use with J38402)
A-50 Strut compressor adapter		Compression of the rear coil spring (use with J38402)
J38402 Strut spring compressor		Compression of the front & rear coil spring (use with A-42 or A-20)
09545-11000 (A,B) Ball joint remover and installer		Installation of the front lower arm ball joint
09545-3A000 Lower arm bushing remover		Removal of lower arm bushing

Suspension System > General Information > Troubleshooting

TROUBLESHOOTING

Symptom	Possible cause	Remedy
Hard steering	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Low tire pressure No power assist	Correct Replace Adjust Repair and replace
Poor return of steering wheel to center	Improper front wheel alignment	Correct
Poor rough ride	Improper front wheel alignment Malfunctioning shock absorber Broken or worn stabilizer Broken or worn coil spring Worn lower arm bushing	Correct Repair or replace Replace Replace Replace the lower arm assembly

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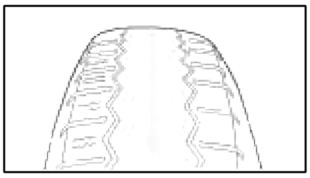
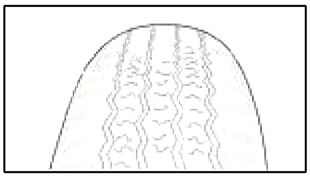
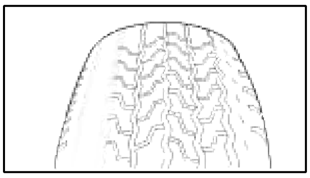
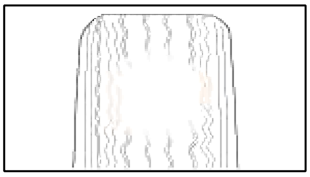
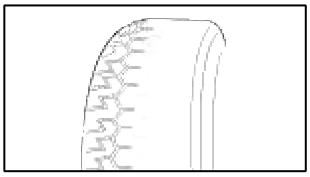
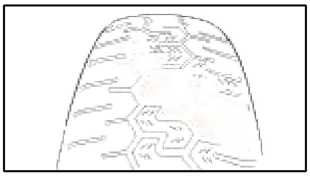
Abnormal tire wear	Improper front wheel alignment Improper tire pressure Malfunctioning shock absorber	Correct Adjust Replace
Wandering	Improper front wheel alignment Poor turning resistnace of lower arm ball joint Loose or worn lower arm bushing	Correct Repair Retighten or replace
Vehicle pulls to one side	Improper front wheel alignment Excessive turning resistance of lower arm ball joint Broken or worn coil spring Bent lower arm	Correct Replace Replace Repair
Steering wheel shimmy	Improper front wheel alignment Poor turning resistance of lower arm ball joint Broken or worn stabilizer Worn lower arm bushing Malfunctioning shock absorber Broken or worn coil spring	Correct Replace Replace Replace Replace Replace
Bottoming	Broken or worn coil spring Malfunctioning shock absorber	Replace Replace

WHEEL AND TIRE DIAGNOSIS		
Rapid wear at the center	Rapid wear at both shoulders	Wear at one shoulder
		
• Center- tread down to fabric due to excessive over inflated tires • Lack of rotation • Excessive toe on drive wheels • Heavy acceleration on drive	• Underinflated tires • Worn suspension components • Excessive cornering speeds • Lack of rotation	• Toe adjustment out of specification • Camber out of specification • Damaged strut • Damaged lower arm

WHEEL AND TIRE DIAGNOSIS		
Partial wear	Feather edges wheels	Wear pattern
		
• Cansed by irreqular burrs on brak drums.	• Toe adjustment out of specification • Damaged or worn tie rods • Damaged knuckle	• Excessive toe on non-drive wheels • Lack of rotation

Suspension System > General Information > Specifications

SPECIFICATIONS

Front suspension system	**Macpherson strut with coil spring**

Coil spring

Model	**Free height mm (in.)**	**Identification color**
Standard Manual Transmission Automatic Transmission (including M/T + P/S + ABS + A/C)	 324 (12.8) 333.8 (13.1)	 Green -1 Green-1, White-1
Sporty suspension Manual Transmission Automatic Transmission (including M/T + P/S + ABS + A/C)	 313.7 (12.4) 322.7 (12.7)	 Green-2 Green-1, Pink-1

M/T : Manual Transmission
P/S : Power Steering
ABS : Anti-lock Brake System
A/C : Air Conditioner

Shock absorber

<table>
<tr><th>Item</th><th colspan="9">Specification</th></tr>
<tr><td>Type</td><td colspan="9">Oil type/Gas type</td></tr>
<tr><td>Stroke mm (in)</td><td colspan="9">161 (6.3)</td></tr>
<tr><td rowspan="2">Damping force at piston speed 0.3 m/s
Expansion N(kgf)
Compression N(kgf)</td><td colspan="5">Standard</td><td colspan="4">Sporty suspension</td></tr>
<tr><td colspan="5">550 ± 90 (55 ± 9)
260 ± 60 (26 ± 6)</td><td colspan="4">1090±160 (109±6)
490±100 (49±10)</td></tr>
<tr><td rowspan="4">Identification color</td><td rowspan="2"></td><td colspan="2">CBS</td><td colspan="2">ABS</td><td colspan="2">CBS</td><td colspan="2">ABS</td></tr>
<tr><td>LH</td><td>RH</td><td>LH</td><td>RH</td><td>LH</td><td>RH</td><td>LH</td><td>RH</td></tr>
<tr><td>Upper</td><td>Orange</td><td>Orange</td><td>Violet</td><td>Violet</td><td>Blue</td><td>Blue</td><td>Pink</td><td>Pink</td></tr>
<tr><td>Lower</td><td></td><td>Orange</td><td></td><td>Violet</td><td></td><td>Blue</td><td></td><td>Pink</td></tr>
</table>

CBS : Convertional Brake System
LH : Left hand side
ABS : Anti-lock Brake System
RH : Right hand side

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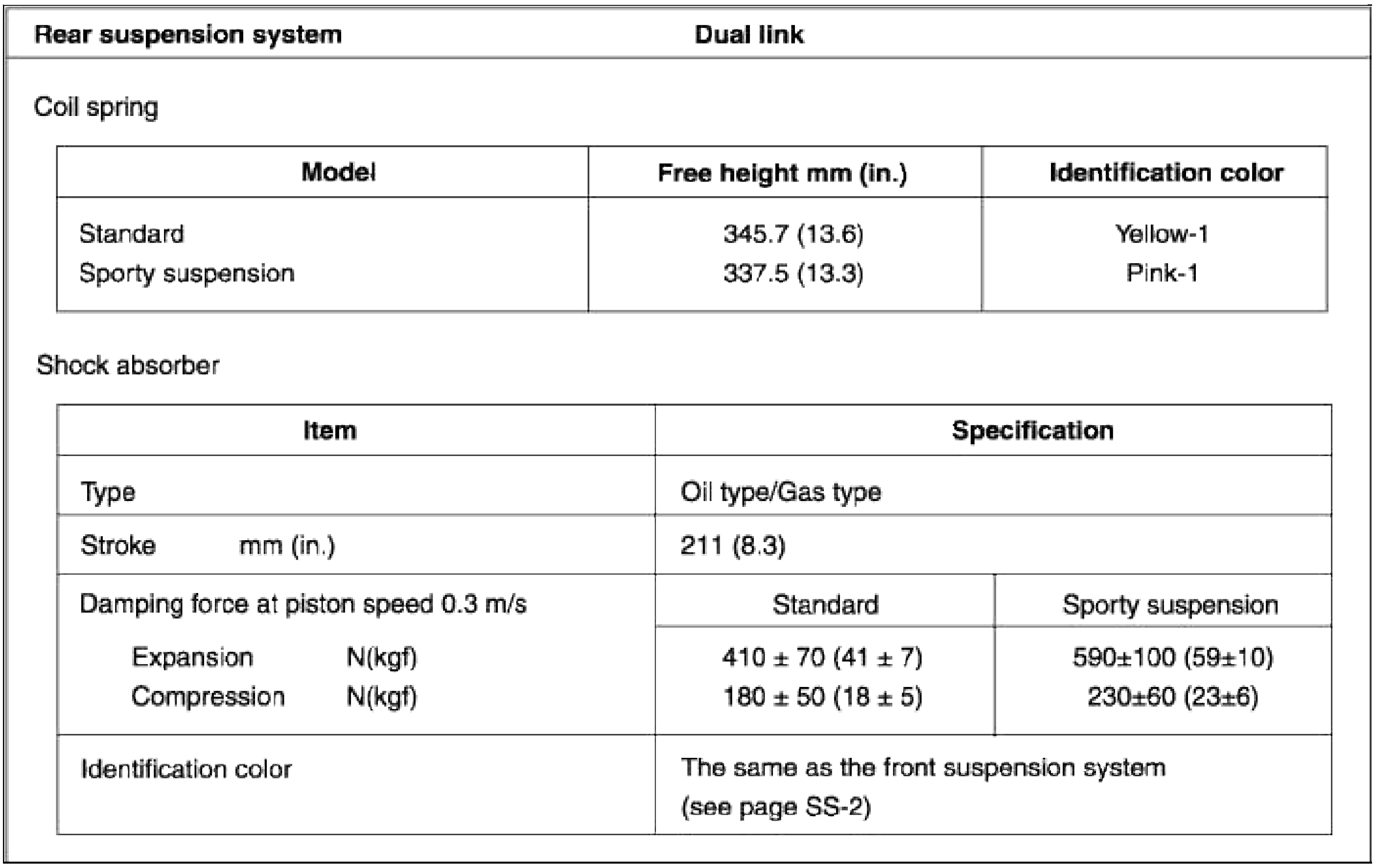


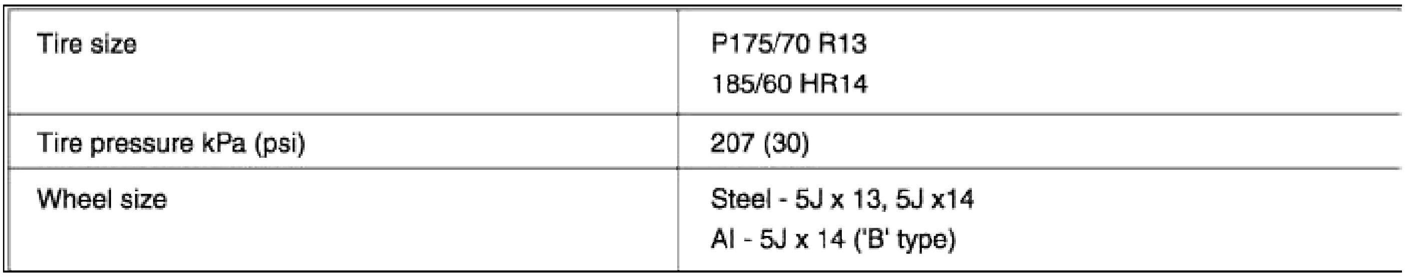
Rear suspension system	Dual link

Coil spring

Model	Free height mm (in.)	Identification color
Standard	345.7 (13.6)	Yellow-1
Sporty suspension	337.5 (13.3)	Pink-1

Shock absorber

Item	Specification	
Type	Oil type/Gas type	
Stroke mm (in.)	211 (8.3)	
Damping force at piston speed 0.3 m/s	Standard	Sporty suspension
Expansion N(kgf)	410 ± 70 (41 ± 7)	590±100 (59±10)
Compression N(kgf)	180 ± 50 (18 ± 5)	230±60 (23±6)
Identification color	The same as the front suspension system (see page SS-2)	



Tire size	P175/70 R13 185/60 HR14
Tire pressure kPa (psi)	207 (30)
Wheel size	Steel - 5J x 13, 5J x14 Al - 5J x 14 ('B' type)

SERVICE STANDARD

Standard value	Front	Rear
Toe-in mm(in.)	0 ± 3 (0 ± 0.12)	3 ± 2 (0.12 ± 0.0787)
Camber	0 ± 30′	-41′ ± 30′
Caster	1°48′ ± 30′	
King pin inclination angle	11°03′ ± 30′	
King pin offset mm(in.)	5.8 (0.23)	
Wheel runout Radial Axial	**Steel wheel** 0.6mm (0.028 in.) : Average of LH & RH 0.8mm (0.032 in.)	**Aluminum wheel** 0.3mm (0.012 in.) 0.3mm (0.012 in.)

TIGHTENING TORQUE

Items	Nm	kgf·cm	lbf·ft
Castle nut Strut upper installation nut * Strut assembly to knuckle Front strut mounting self locking nut Lower arm ball joint to knuckle Lower arm/lower arm bracket mounting bolt Tie rod end ball joint to knuckle Rear roll stopper to sub-frame bolt Rear roll stopper mounting nut Rear strut mounting self locking nut Rear stabilizer link to stabilizer bar Rear stabilizer bar bracket bolt Rear suspsension arm (A,B) to axle carrier Rear suspension arm (A) to body frame * Rear suspension arm (B) to body frame * Trailing arm to axle carrier nut * Trailing arm to bracket nut Trailing bracket to body frame	220 ~ 260 20 ~ 30 75 ~ 90 60 ~ 70 60 ~ 72 95 ~ 120 15 ~ 34 30 ~ 40 45 ~ 60 45 ~ 50 35 ~ 45 17 ~ 26 130 ~ 150 100 ~ 120 80 ~ 100 130 ~ 150 100 ~ 120 40 ~ 50	2200 ~ 2600 200 ~ 300 750 ~ 900 600 ~ 700 600 ~ 720 950 ~ 1200 150 ~ 340 300 ~ 400 450 ~ 600 450 ~ 500 350 ~ 450 170 ~ 260 1300 ~ 1500 1000 ~ 1200 800 ~ 1000 1300 ~ 1500 1000 ~ 1200 400 ~ 500	162 ~ 192 14 ~ 22 55 ~ 66 43 ~ 51 43 ~ 52 69 ~ 87 11 ~ 25 22 ~ 29 33 ~ 44 33 ~ 37 26 ~ 33 13 ~ 19 96 ~ 110 74 ~ 88 59 ~ 74 96 ~ 110 74 ~ 88 30 ~ 37

- Replace the self-locking nuts with new ones after removal.
- '*' parts should be temporarily tightened, and then fully tighted with the vehicle on the ground in an unladen condition.

LUBRICANTS

Location	Recommended lubricant	Quantity
In ball joint of lower arm	Variant R-2 grease or poly lub gly 801 K	As required
In insulator bearing strut	SAE J310a, Chassis grease (NLGI No. 0 or equivalent)	As required
In rear statilizer link case	Lubchem SB 6042M or Sunlight MB2	As required

Suspension System > Front Suspension System > Front Strut Assembly > Components and Components Location

COMPONENTS

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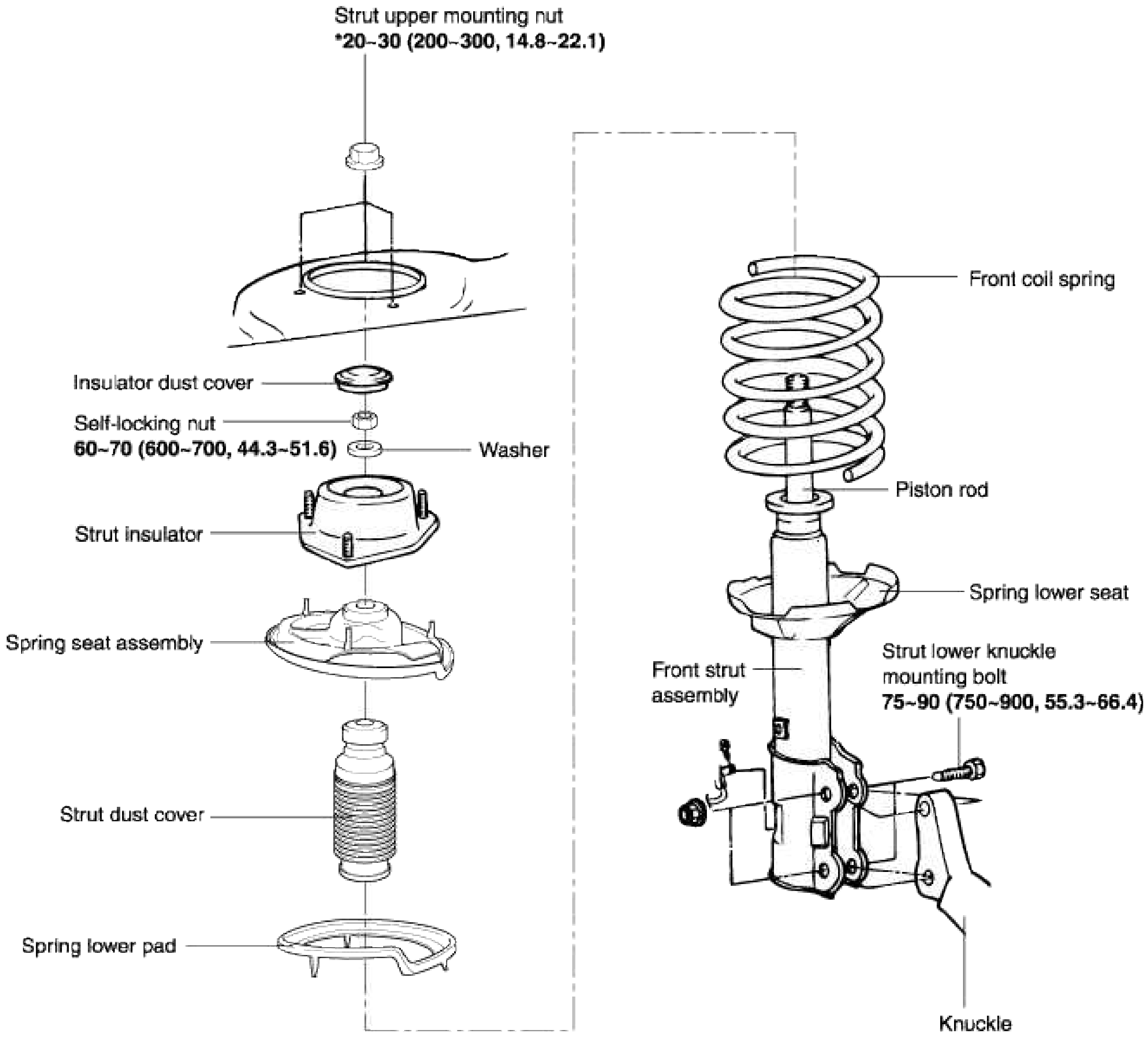

Strut upper mounting nut
*20~30 (200~300, 14.8~22.1)
Insulator dust cover
Self-locking nut
60~70 (600~700, 44.3~51.6)
Washer
Strut insulator
Spring seat assembly
Strut dust cover
Spring lower pad
Front coil spring
Piston rod
Spring lower seat
Front strut assembly
Strut lower knuckle mounting bolt
75~90 (750~900, 55.3~66.4)
Knuckle

CAUTION

* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

TORQUE : Nm (kgf·cm, lbf·ft)

Suspension System > Front Suspension System > Front Strut Assembly > Repair procedures

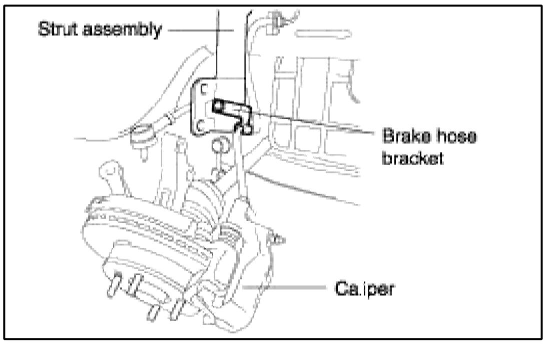
REMOVAL

1. Remove the front wheel.

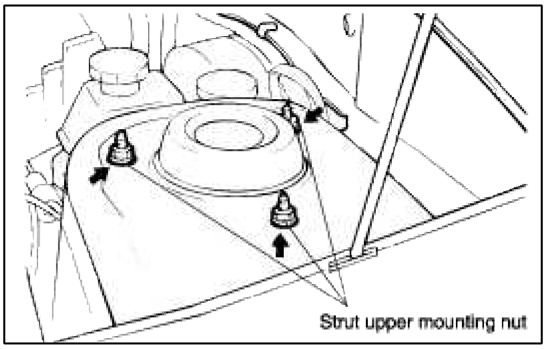
2. Detach the brake hose bracket from the strut assembly.

NOTE

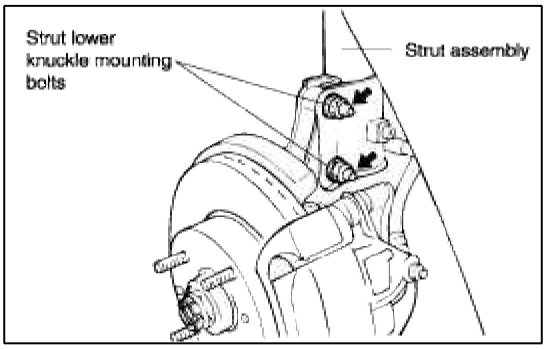
Do not pry or force the components excessively.


Strut assembly
Brake hose bracket
Caliper

3. Remove the strut upper mounting nuts(3).


Strut upper mounting nut

4. Remove the strut lower kunckle mounting bolts(2).


Strut lower knuckle mounting bolts
Strut assembly

5. Remove the strut assembly.
6. Installation is the reverse of removal.

DISASSEMBLY

1. Remove the insulator dust cover with a flat-tip screw driver.

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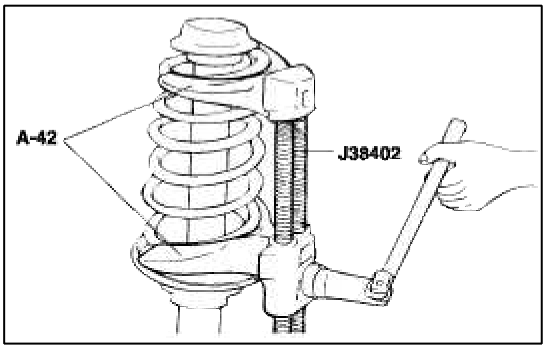
2. Using the special tool(J38402), compress the coil spring until there is only a little tension on the strut.

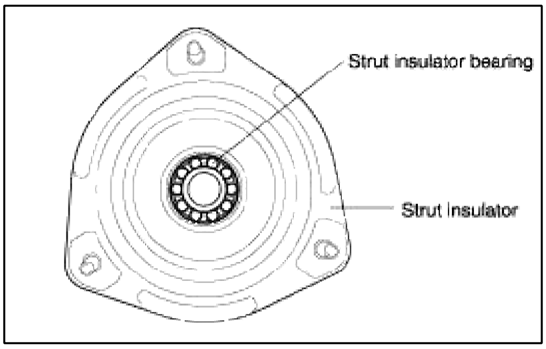
> **NOTE**
>
> Do not use an impact gun.



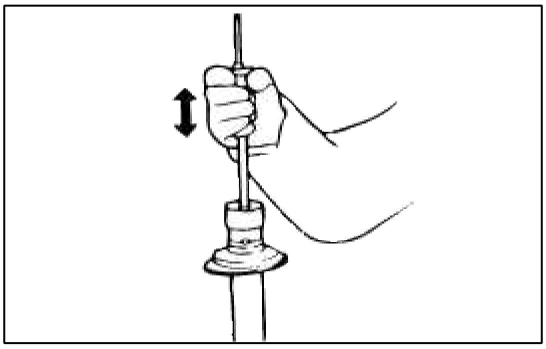
3. Remove the lock-nut at the top end of the shock absorber.
4. Remove the strut insulator, spring seat assembly, coil spring and strut dust cover.

INSPECTION

1. Check the strut insulator bearing for wear or damage.

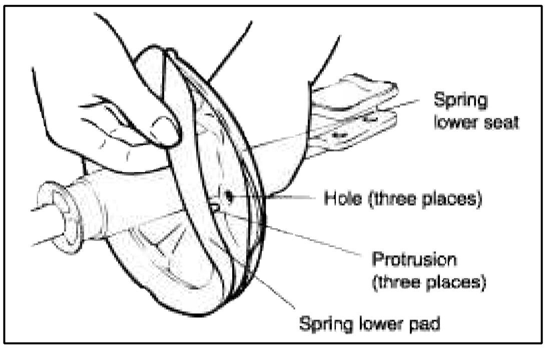


2. Check the rubber parts (Insulator dust cover, Strut insulator, Spring seat assembly, Strut dust cover, Spring lower pad) for damage or deterioration.
3. Check the coil spring for sagging and weakness.
4. Reassemble all the parts except for the coil spring.
5. Repeat pushing and pulling of the damper assembly as shown.
6. Check for smooth operation through a full stroke.
   If there is no compression, no extension and the gas is leaking, it is strongly recommended that the damaper should be replaced.



REASSEMBLY

1. Install the spring lower pad with the protrusions fitted in the holes of the spring lower seat.

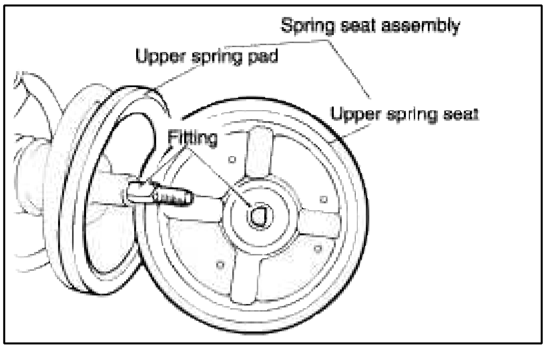

Spring
lower seat
Hole (three places)
Protrusion
(three places)
Spring lower pad

2. Install the strut dust cover on the shock absorber.
3. Using special tool(J38402, A-42), compress the coil spring.
   After the spring is fully compressed, install it on the shock absorber.

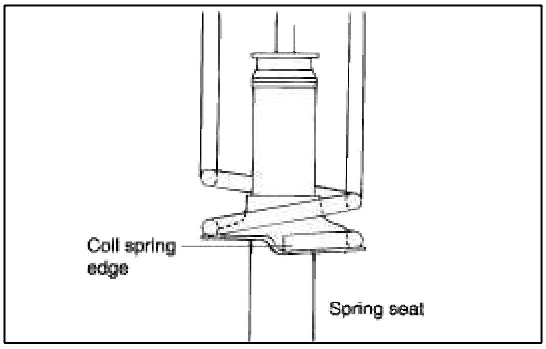
> **NOTE**
>
> Install the coil spring with the identification color mark facing toward the knuckle.

4. After fully extending the piston rod, install the spring seat assembly and the strut insulator.

> **NOTE**
>
> Align the D-shaped hole in the spring seat assembly with the indentation on the piston rod.


Spring seat assembly
Upper spring pad
Upper spring seat
Fitting

5. After having correctly seated the upper and lower ends of the coil spring in the upper and lower spring seat grooves, install the new self-lockingnut but do not tighten it.


Coil spring
edge
Spring seat

6. Remove the special tool (J38402, A-42).
7. Tighten the self-locking nut to the specified torque.

Tightening torque
60~70 Nm (600~700 kgf·cm, 43~51 lbf·ft)

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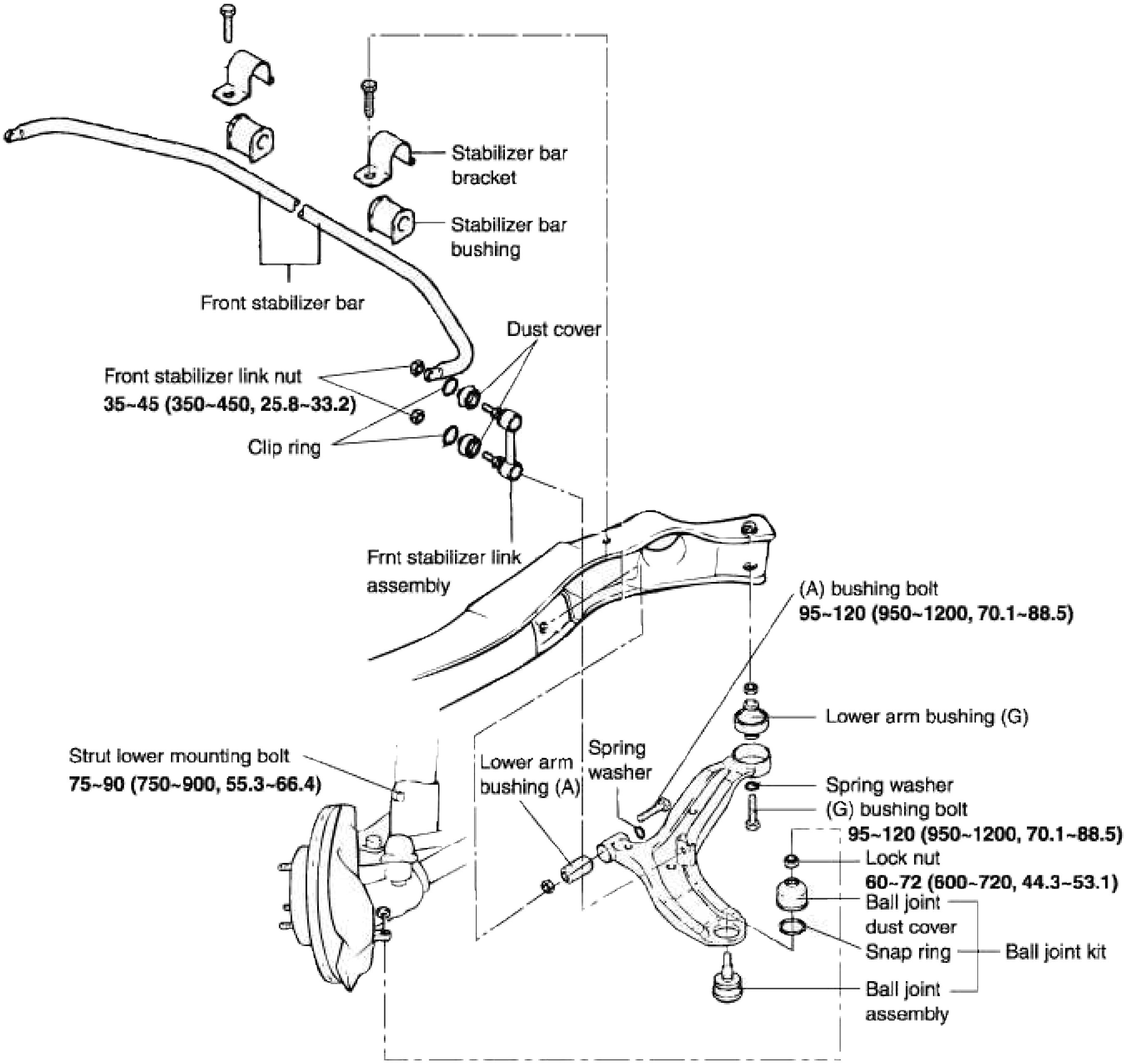
8. Pack grease in the strut insulatior bearing and install the insulator dust cover.

> **CAUTION**
>
> Make sure that no grease is on the insulator rubber. (see page SS-3)

Suspension System > Front Suspension System > Front Lower Arm > Components and Components Location

COMPONENTS

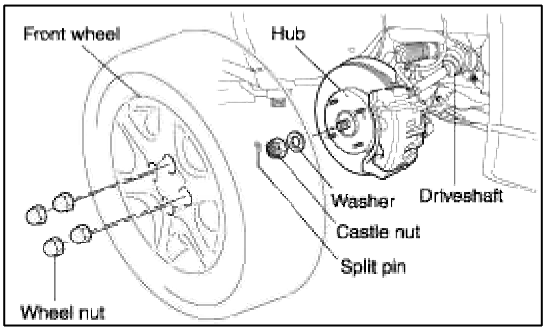

Stabilizer bar bracket
Stabilizer bar bushing
Front stabilizer bar
Dust cover
Front stabilizer link nut
35~45 (350~450, 25.8~33.2)
Clip ring
Frnt stabilizer link assembly
(A) bushing bolt
95~120 (950~1200, 70.1~88.5)
Lower arm bushing (G)
Strut lower mounting bolt
75~90 (750~900, 55.3~66.4)
Lower arm bushing (A)
Spring washer
Spring washer
(G) bushing bolt
95~120 (950~1200, 70.1~88.5)
Lock nut
60~72 (600~720, 44.3~53.1)
Ball joint dust cover
Snap ring
Ball joint assembly
Ball joint kit

TORQUE : Nm (kgf·cm, lbf·ft)

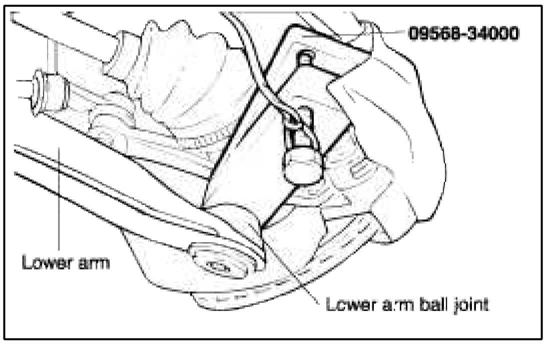
Suspension System > Front Suspension System > Front Lower Arm > Repair procedures

REMOVAL

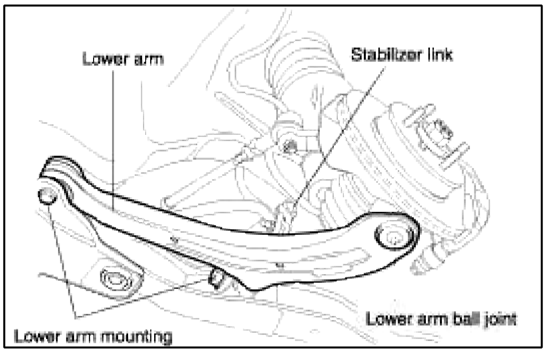
1. Remove the front wheel and tire.
2. Remove the split pin, the castle nut and the washer.


Front wheel
Hub
Washer
Driveshaft
Castle nut
Split pin
Wheel nut

3. Loosen the lower arm ball joint nut, but do not remove it.
4. Remove the strut lower mounting bolts(2).
5. Push the axle hub outward to disconnect the drive shaft from the axle hub.
6. Using the special tool(09568-34000), disconnect the lower arm ball joint from the lower arm.


09568-34000
Lower arm
Lower arm ball joint

7. Install the strut lower mounting bolt temporarily.
8. Remove the stabilizer link nut.
9. Remove the lower arm bushing (A) and bushing (G) mounting bolts(2).


Lower arm
Stabilizer link
Lower arm ball joint
Lower arm mounting

10. Remove the lower arm assembly.

INSTALLATION

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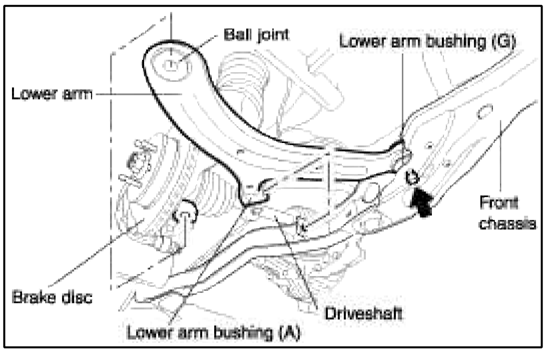
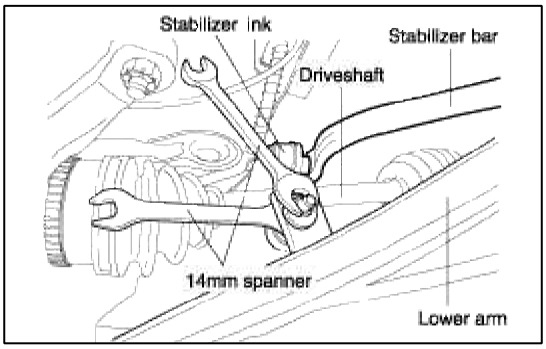
1. First, fix the lower arm bushing (G) and then bolt up slightly.


Ball joint
Lower arm bushing (G)
Lower arm
Front chassis
Brake disc
Driveshaft
Lower arm bushing (A)

2. It would be better to insert the driveshaft spline and the ball joint in the knuckle nearly at the same time.
3. Install the stabilizer link in the lower arm assembly the moment the driveshaft is inserted gradually.
   Do not, however, tighten the self-locking nut in this step.
4. Push the brake disc and hub inward in order to assemble the lower arm bushing (A) to the front chassis.
5. Tighten the lower arm bushing (A) bolt.
6. Tighten the lower arm bushing (G) bolt completely.
7. After fixing the stabilizer link using 14mm spanner, tighten the self-locking nut.

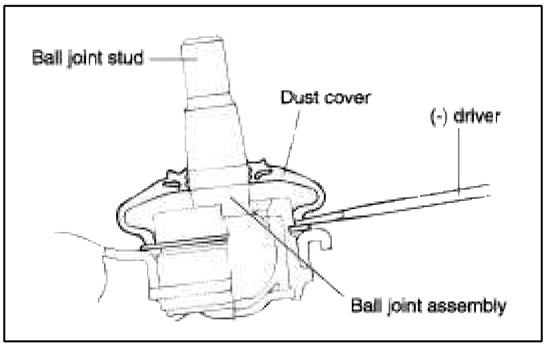

Stabilizer link
Stabilizer bar
Driveshaft
14mm spanner
Lower arm

8. Assemble the washer, castle nut and split pin.
9. Install the wheel and tire.

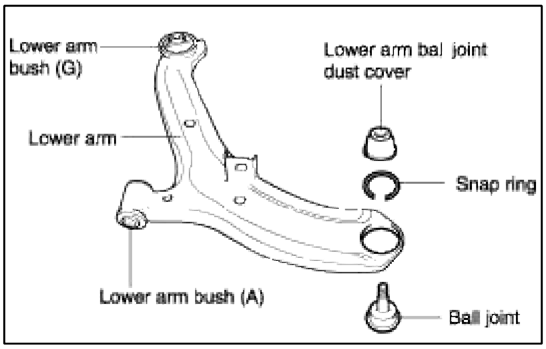
REPLACEMENT

BALL JOINT AND DUST COVER REPLACEMENT

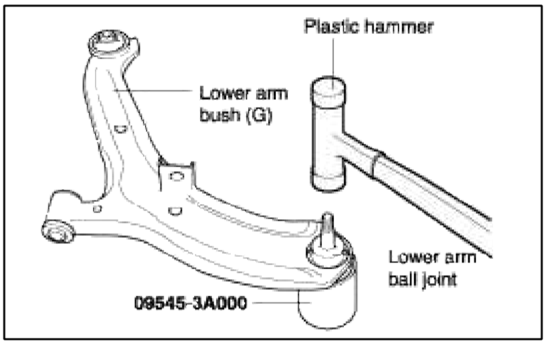
1. Using a screwdriver, remove the dust cover from the lower arm ball joint.


Ball joint stud
Dust cover
(-) driver
Ball joint assembly

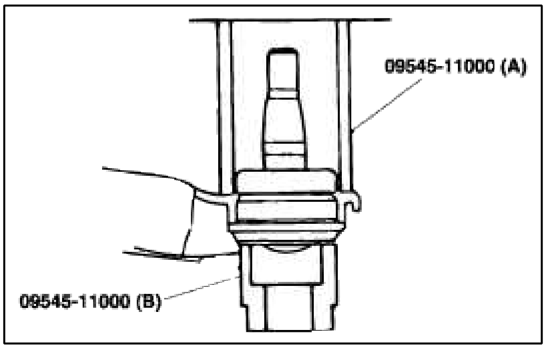
2. Remove the snap ring.


Lower arm bush (G)
Lower arm bal joint dust cover
Lower arm
Snap ring
Lower arm bush (A)
Ball joint

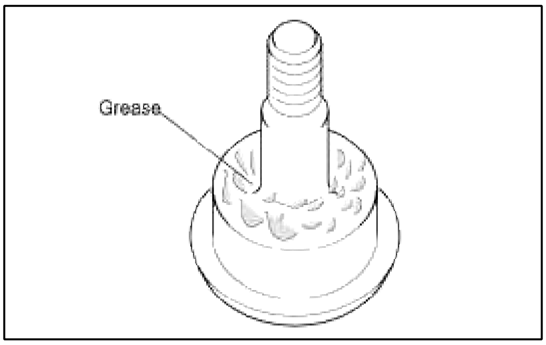
3. Using a plastic hammer, disconnect the ball joint from the lower arm.
   Hammering with the special tool (09545-3A000) placed under the lower arm as shown may prevent the deformation of the lower arm.


Plastic hammer
Lower arm bush (G)
Lower arm ball joint
09545-3A000

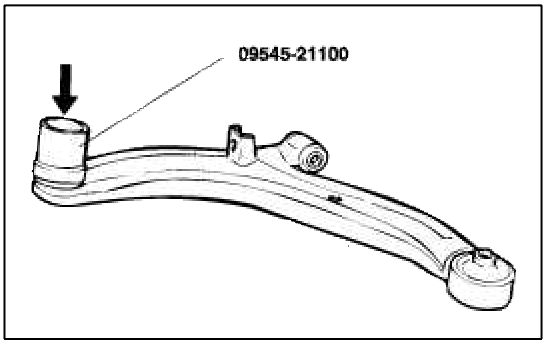
4. Using the special tool (09545-11000), press the ball joint into the lower arm assembly.
   Unless it it pressed firmly, the snap ring will not fit perfectly to the groove.


09545-11000 (A)
09545-11000 (B)

5. Install the snap ring.
6. If there is not sufficient grease on the ball joint assembly, apply grease abundantly.



7. Using the special tool (09545-21100), install the dust cover. The special tool will make the installation process even easier.


09545-21100

LOWER ARM BUSHING (A) REPLACEMENT

1. Install the special tool (09545-25000) and the lower arm on the press-machine.

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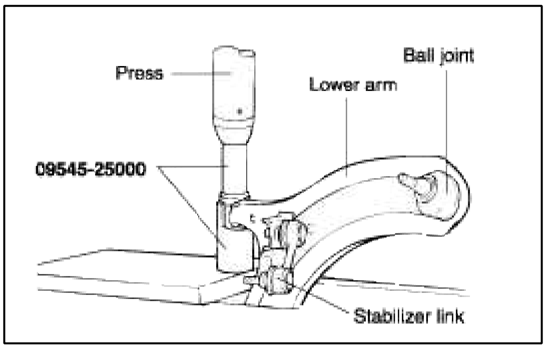
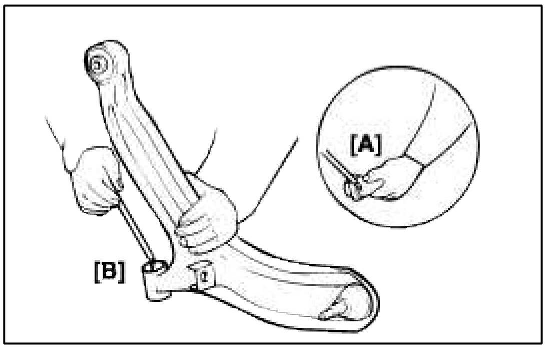
2. Remove the bushing (A).



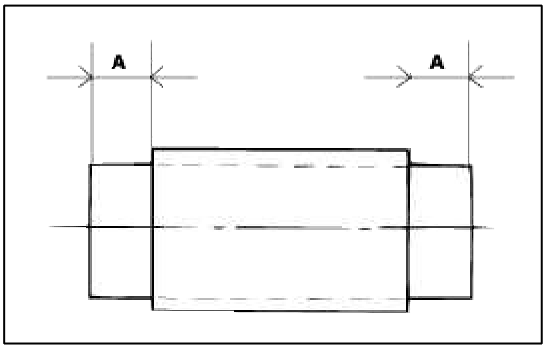
3. Apply soap solution to the following parts.
   - A. Outer surface of the new bushing (A).
   - B. Inner surface of the lower arm bushing mount (B).



4. Install the new bushing onto the lower arm by using special tool.
5. Center the bushing by using by the following procedure, if necessary.
   - A. Reset the special tool and lower arm.
   - B. Center the bushing.

NOTE

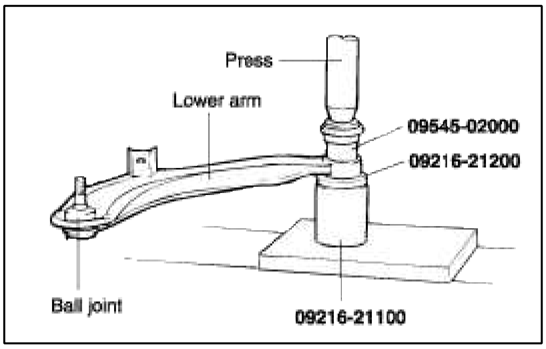
After centering the bushing, wipe off the soap solution.



LOWER ARM BUSHING (G) REPLACEMENT

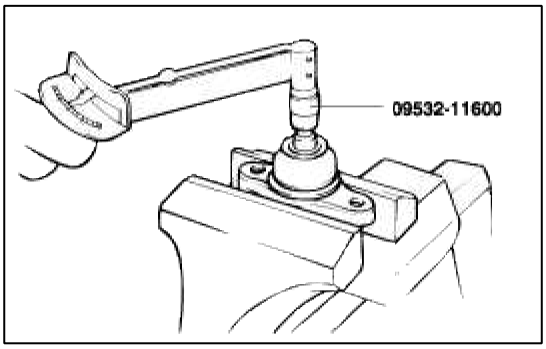
1. Install the special tool (09216-21100, 09216-21200, 09545-02000) and the lower arm.
2. Press out the bushing (G).
3. Apply soap solution to the following parts.
   - A. Outer surface of the bushing.
   - B. Inner surface of the lower arm bushing mount.

4. Install the new bushing onto the lower arm by using special tool (09216-21100, 09216-21200, 09545-02000).



INSPECTION

1. Check the bushing for wear and deterioration.
2. Check the lower arm for bending or breakage.
3. Check the ball joint dust cover for cracks.
4. Check all bolts.
5. Check the lower arm ball joint for rotating torque.



A. If a crack is noted in the dust cover, replace the ball joint assembly.
B. Shake the ball joint stud several times. (see page SS-12)
C. Measure the balll joint rotating torque.

Standard value
2.5~9 Nm (25~90 kgf·cm, 1.8~6.6 lbf·ft)

D. If the rotating torque exceeds the upper limit of the standard value, replace the ball joint assembly.
E. Even if the rotating torque is below the lower limit of the standard value, the ball joint may be reused, unless it has drag and excessive play.

Suspension System > Front Suspension System > Front Stabilizer Bar > Components and Components Location

COMPONENTS

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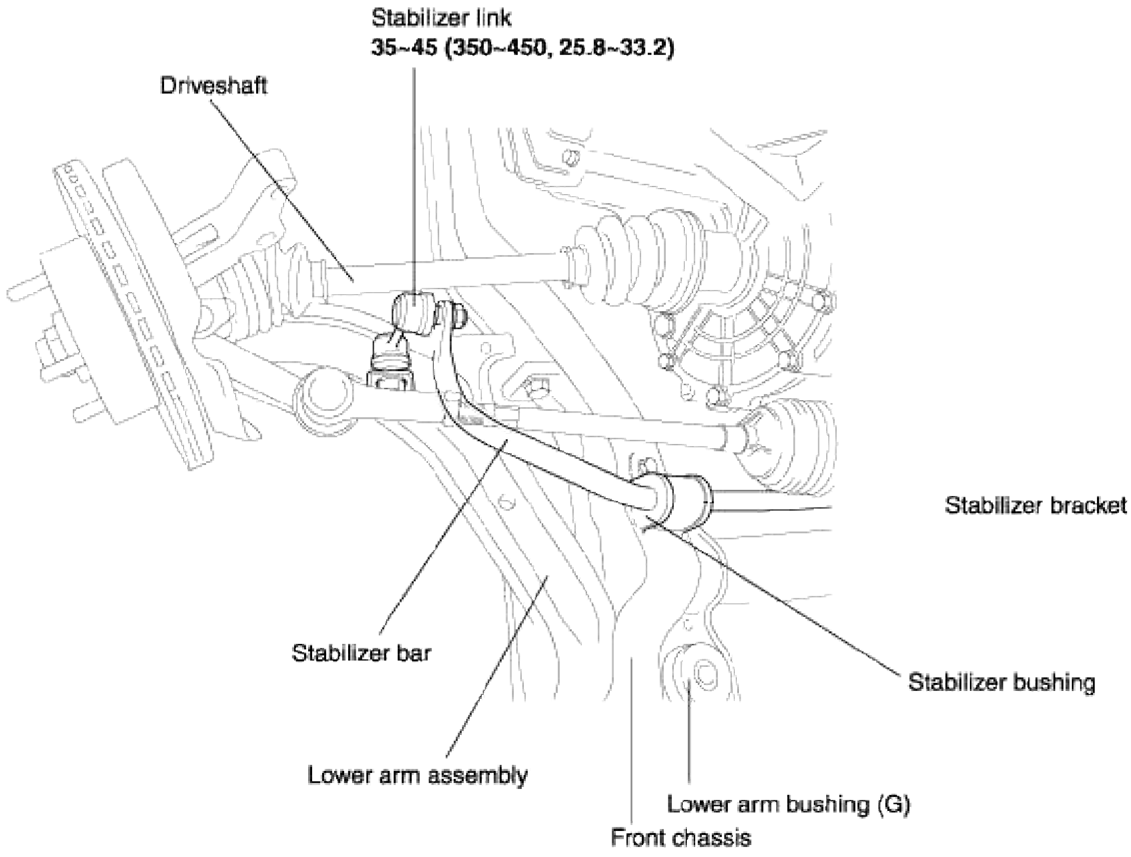
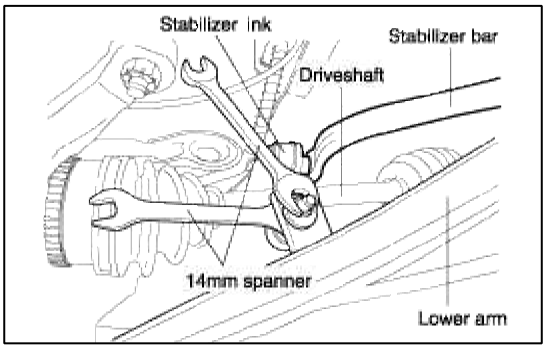

Stabilizer link
35~45 (350~450, 25.8~33.2)
Driveshaft
Stabilizer bracket
Stabilizer bar
Stabilizer bushing
Lower arm assembly
Lower arm bushing (G)
Front chassis

TORQUE : Nm (kgf·cm, lbf·ft)

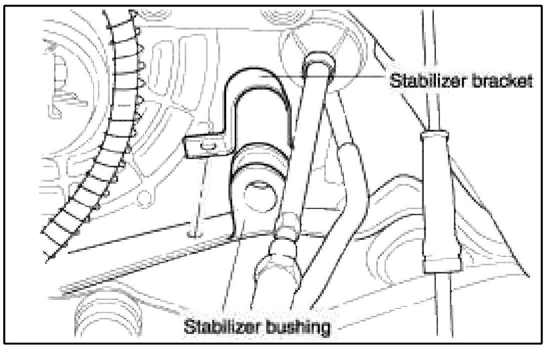
Suspension System > Front Suspension System > Front Stabilizer Bar > Repair procedures

REMOVAL

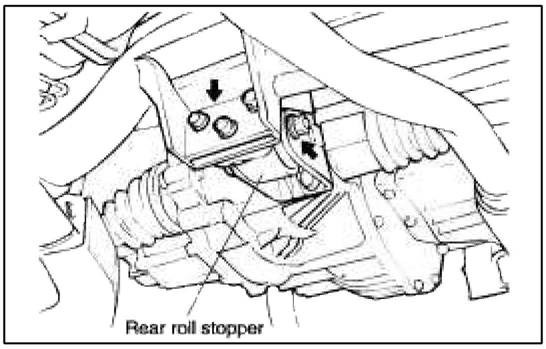
1. Remove the front wheel.
2. Remove the stabilizer link assembly.


Stabilizer link
Stabilizer bar
Driveshaft
14mm spanner
Lower arm

3. Remove the stabilizer bracket and bushing.


Stabilizer bracket
Stabilizer bushing

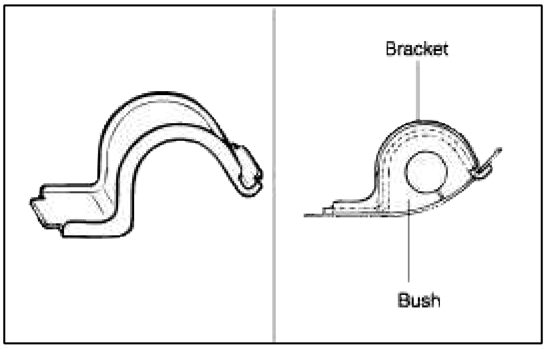
4. Remove the rear roll stopper.



5. Remove the stabilizer bar.

INSTALLATION

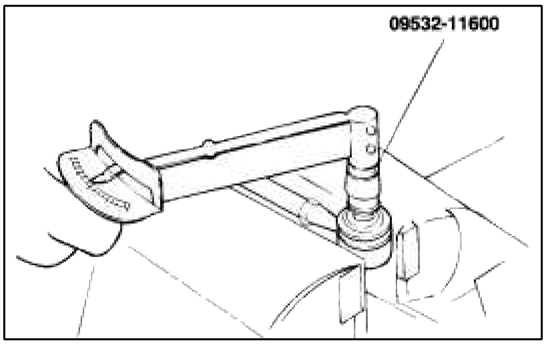
1. Install the bushing onto the stabilizer bar.
2. Align the bracket with the bushing.
   Make sure the projections are securely in the space of the bracket.



3. Using the access opening, temporarily tighten the bushing fixtures then position the bushing on the opposite side.
4. Secure the stabilizer link with a open-end wrench (14 mm) then install the self locking nut.

INSPECTION

1. Check the stabilizer bar for deterioration and damage.
2. Check all bolts for condition and straightness.
3. Check the stabilizer link dust cover for cracks or damage.
4. Check the stabilizer link ball joint rotating torque.



A. If there is a crack in the dust cover, replace it and add grease.
B. Shake the stabilizer link ball joint stud several times.
C. Mount the self-locking nut on the ball joint, and then measure the ball jointrotating torque.

Standard value
1.7~3.2 Nm (17~32 kgf·cm, 1.3~2.4 lbf·ft)

D. If the rotating torque exceeds the upper limit of the standard value, replacethe stabilizer link.

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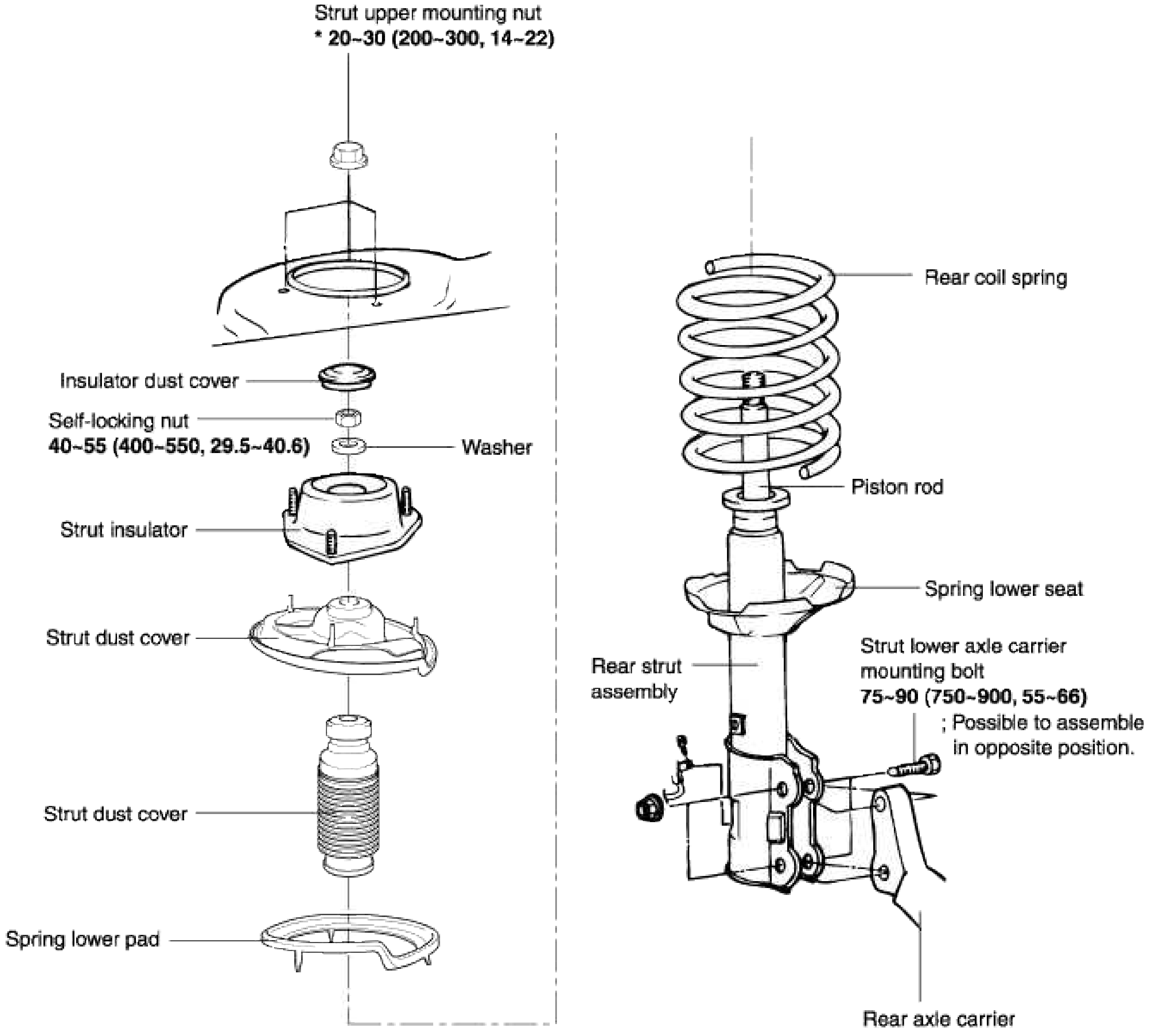
E. Even if the rotating torque is below the lower limit of the standard value, the ball joint may be reused unless it has drag and excessive play.

Suspension System > Rear Suspension System > Rear Strut Assembly > Components and Components Location

COMPONENTS


Strut upper mounting nut
* 20~30 (200~300, 14~22)
Insulator dust cover
Self-locking nut
40~55 (400~550, 29.5~40.6)
Washer
Strut insulator
Strut dust cover
Strut dust cover
Spring lower pad
Rear coil spring
Piston rod
Spring lower seat
Rear strut assembly
Strut lower axle carrier mounting bolt
75~90 (750~900, 55~66)
; Possible to assemble in opposite position.
Rear axle carrier

CAUTION

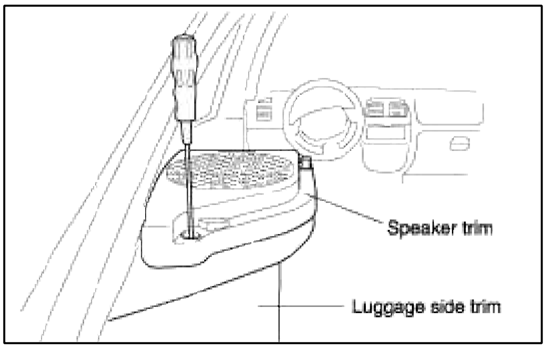
* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

TORQUE : Nm (kgf·cm, lbf·ft)

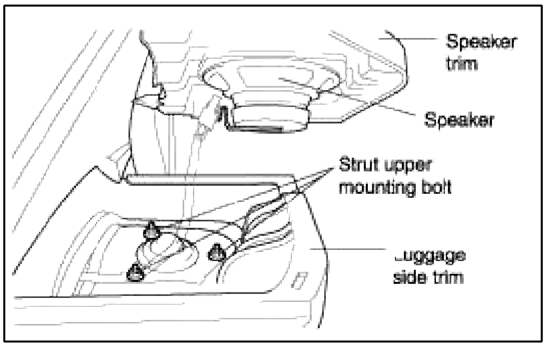
Suspension System > Rear Suspension System > Rear Strut Assembly > Repair procedures

REMOVAL

1. Fold down the rear seat back assembly.
2. Remove the speaker trim and the luggage side trim.


Speaker trim
Luggage side trim

3. Remove the rear strut upper mounting nuts(3).


Speaker trim
Speaker
Strut upper mounting bolt
Luggage side trim

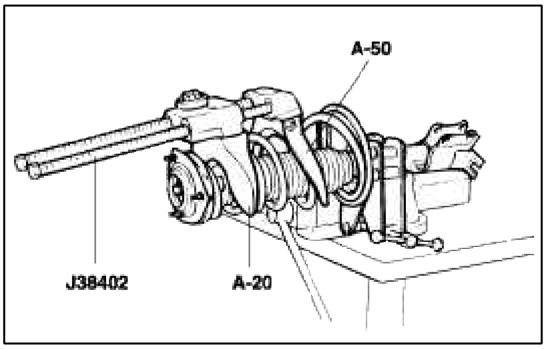
4. Remove the wheel and tire.
5. Disconnect the brake hose and wheel speed sensor wiring from the rear strut.
6. Remove the strut and carrier mounting bolts(2).

> **CAUTION**
>
> Be careful not to drop the rear strut.

7. Remove the rear strut assembly.

DISASSEMBLY

1. Using the special tool (A-20, A-50, J38402), compress the coil spring until there is only a little tension on the strut.

> **NOTE**
>
> Do not use an impact gun.
>
> 
>

A-50
> J38402
> A-20

2. Remove the nut at the top end of the shock absorber.
3. Remove the spring upper seat, coil spring, dust cover and strut assembly.

INSPECTION

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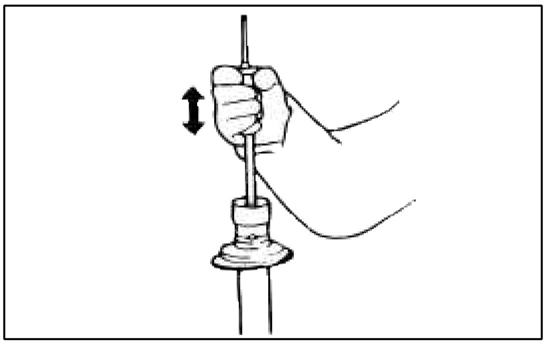
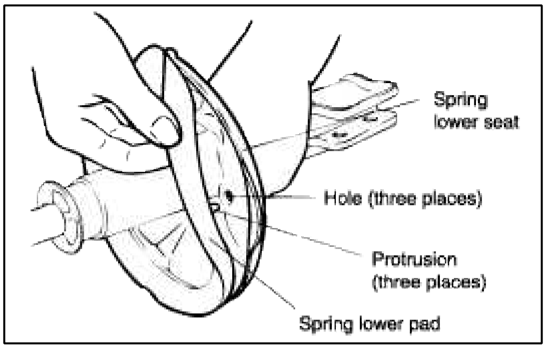
1. Check the insulator for wear or damage.
2. Check the rubber parts for damage or deterioration.
3. Check the coil spring for sagging and weakness.
4. Check the shock absorber for abnornal resistance or unusual sounds.

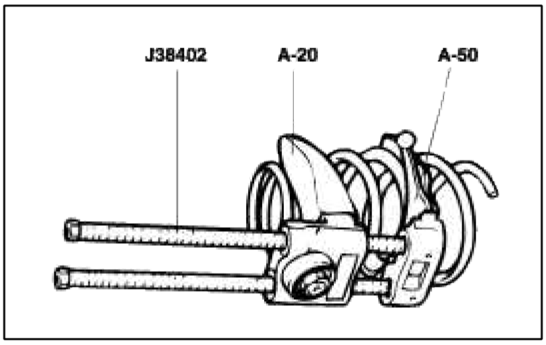


REASSEMBLY

1. Install the lower spring pad so that the protrusions fit through the holes in the spring lower seat.


Spring
lower seat
Hole (three places)
Protrusion
(three places)
Spring lower pad

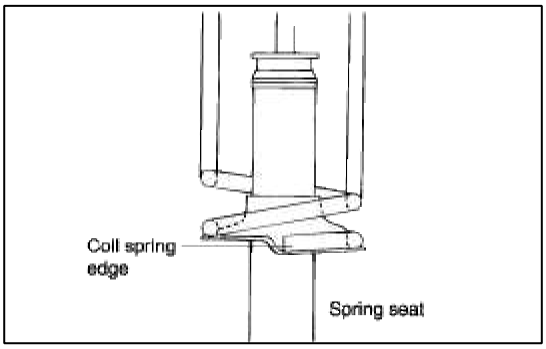
2. Install the dust cover on the shock absorber.
3. Using the special tool (A-20, A-50, J38402), compress the coil spring.
   After spring is fully compressed, install it on the shock absorber.


J38402
A-20
A-50

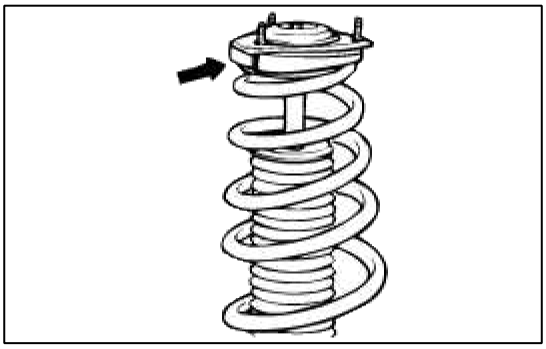
4. After fully extending the piston rod, install the spring seat and insulator assembly.

> **NOTE**
>
> Align the D-shaped hole in the spring seat upper assembly with the indentationon the piston rod.

5. After having correctly seated the upper and lower ends of the coil spring in the upper and lower spring seat grooves, fully install the new self-lockingnut but do not tighten.



6. Position the bolt of the spring seat to align with the projection of the pad as shown in the illustration.



7. Remove the special tool.
8. Tighten the self-locking nut to the specified torque.

Tighting torque

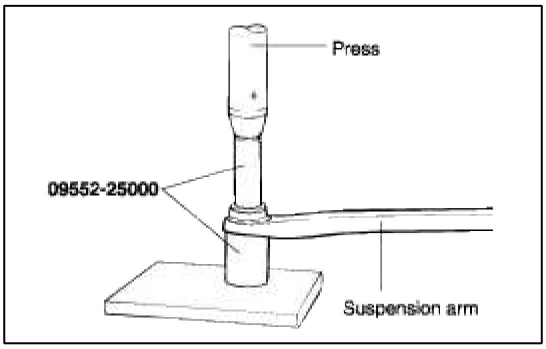
40~55 Nm (400~550 kgf·cm, 29.5~40.6 lbf·ft)

Suspension System > Rear Suspension System > Rear Suspension Arm > Repair procedures

REPLACEMENT

REAR SUSPENSION ARM (A,B) BUSH REPLACEMENT

1. Install the special tool (09552-25000) and the suspension arm on a press.



2. Press out the bushing.
3. Apply soap solution to the new bushing and suspension arm.
4. Using the special tool (09552-25000), press fit the bushing.

Suspension System > Rear Suspension System > Upper Arm, Lower Arm And Assist Link > Components and Components Location

COMPONETS

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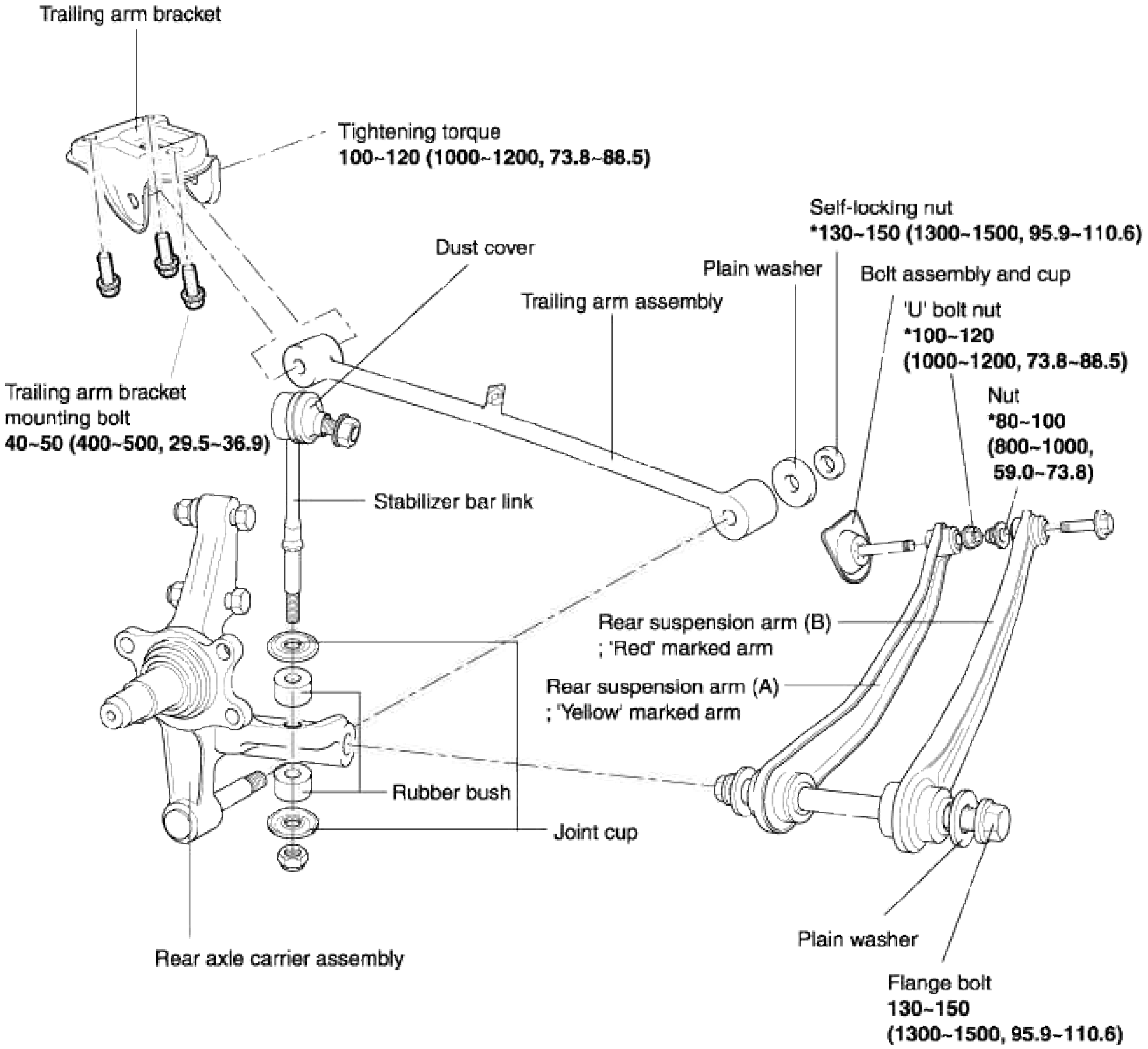

Trailing arm bracket
Tightening torque
100~120 (1000~1200, 73.8~88.5)
Self-locking nut
*130~150 (1300~1500, 95.9~110.6)
Dust cover
Plain washer
Bolt assembly and cup
Trailing arm assembly
'U' bolt nut
*100~120
(1000~1200, 73.8~88.5)
Nut
*80~100
(800~1000,
59.0~73.8)
Trailing arm bracket
mounting bolt
40~50 (400~500, 29.5~36.9)
Stabilizer bar link
Rear suspension arm (B)
; 'Red' marked arm
Rear suspension arm (A)
; 'Yellow' marked arm
Rubber bush
Joint cup
Rear axle carrier assembly
Plain washer
Flange bolt
130~150
(1300~1500, 95.9~110.6)

CAUTION

*** Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in an unladen condition.**

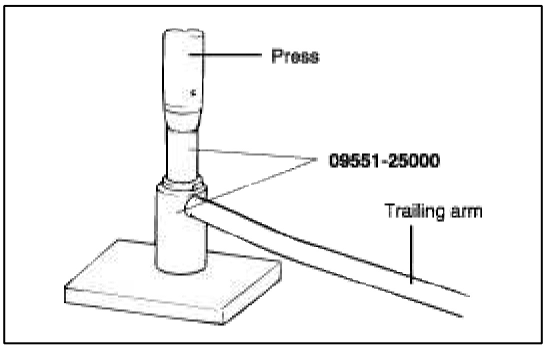
TORQUE : Nm (kgf·cm, lbf·ft)

Suspension System > Rear Suspension System > Trailing Arm > Repair procedures

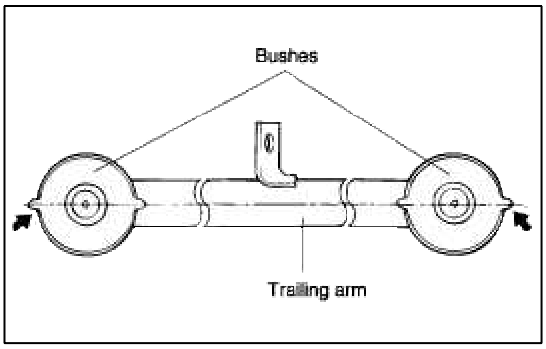
REPLACEMENT

TRAILING ARM BUSH REPLACEMENT

1. Install the special tool(09551-25000) and the trailing arm on a press.



2. Press out the bushing.
3. Apply soap solution to the new bushing and the trailing arm bushing mount.
4. Position the projection of the bushing in a line as shown in the illustration.



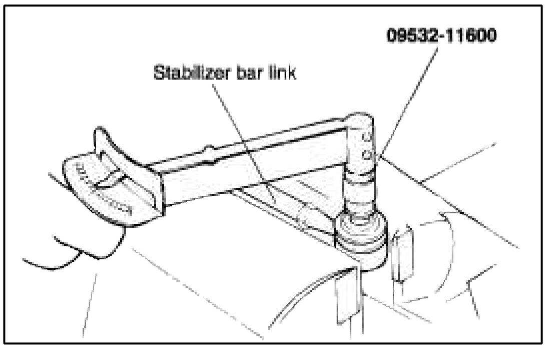
5. Using the special tool (09551-25000), press fit the bushing.

Suspension System > Rear Suspension System > Rear Stabilizer Bar > Repair procedures

REPLACEMENT

REAR STABILIZER BAR REPLACEMENT

1. Remove the stabilizer bar and link assembly.
2. Check the stabilizer link ball joint rotating torque.



   A. If there is a crack in the dust cover, replace it and add grease. (see page SS-4)
   B. Shake the stabilizer link ball joint stud several times.
   C. Mount the self-locking nut on the ball joint, and then measure the ball joint rotating torque.

   Standard value
   0.3~1.0 Nm (3~10 kgf·cm, 0.22~0.73 lbf·ft)

   D. If the rotating torque exceeds the upper limit of the standard value, replace the stabilizer link.
   E. Even if the rotating torque is below the lower limit of the standard value,the ball joint may be reused unless it has drag and excessive play.

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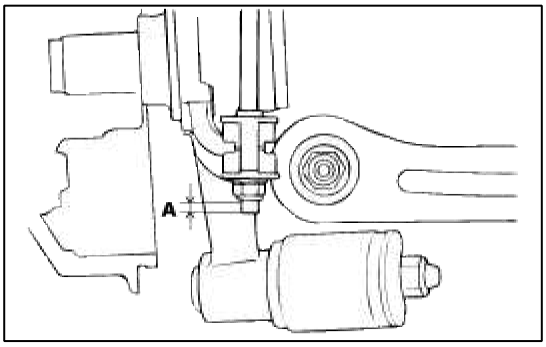
3. Install the stabilizer link lower mounting nut so that the distance (A) is at the standard value.

: 4~6 mm (0.157~0.236 in.)



4. Identification mark of the stabilizer bar must be positioned to the left vehicle mounting.

Suspension System > Tires/Wheels > Tire > Repair procedures

TIRE

TIRE WEAR

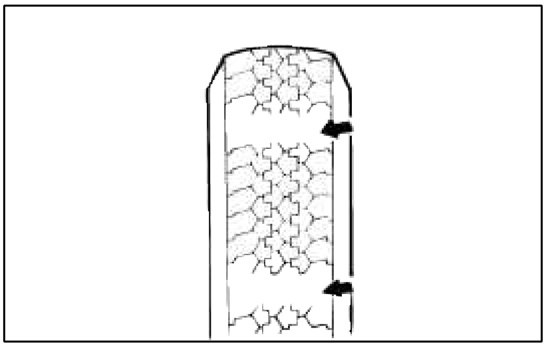
1. Measure the tread depth of the tires.

Tread depth of tire [Limit] : 1.6mm (0.06 in.)

2. If the remaining tread depth is less than the limit, replace the tire.

NOTE

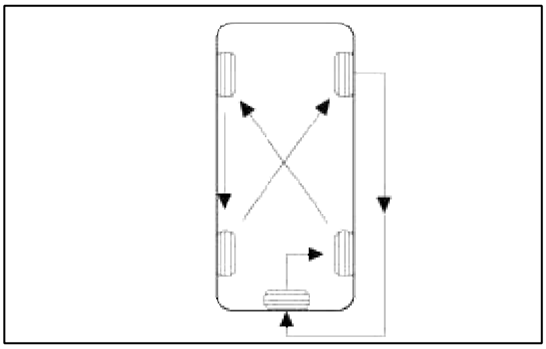
When the tread depth of the tires is less than 1.6 mm (0.06 in.) the wear indicators will appear.



TIRE ROTATION

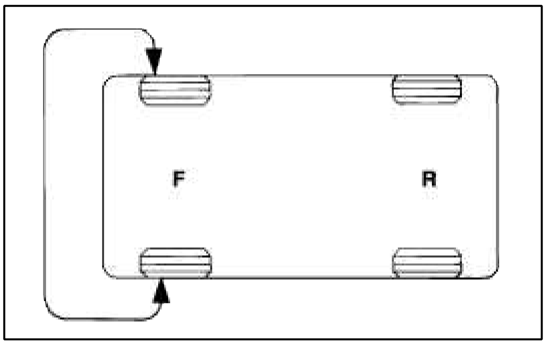
NOTE

The temporary spare tire should not used in the wheel rotation.

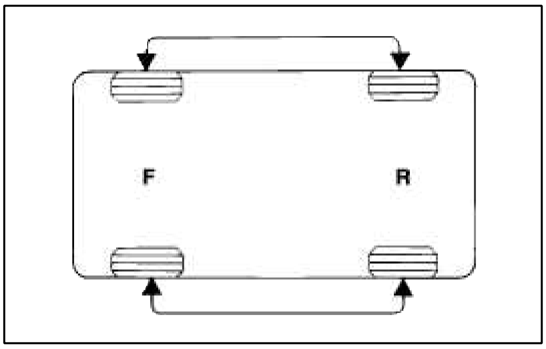


CHECKING FOR PULL AND WANDER

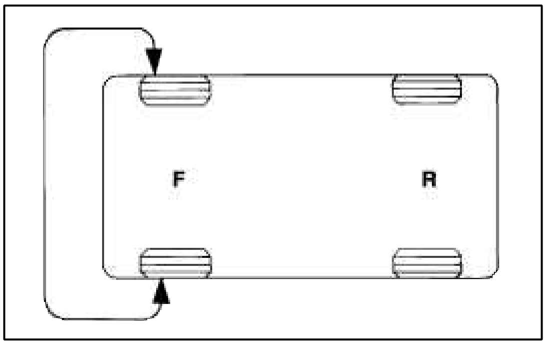
1. Switch the front right and front left tires, and perform the road test inorder to confirm vehicle statility.



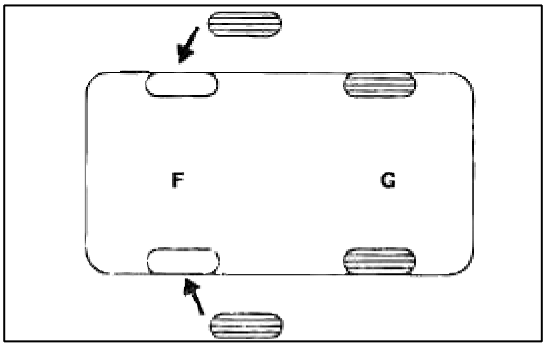
2. If the steering pulls to opposite side, switch the front and rear tires, and again perform the road test.



3. If the steering continues to pull to one side, switch the front right and left tires again, and again perform the road test.



4. If the steering continues to pull to the opposite side, replace the front wheels with new ones.



TIRE CHAINS AND SNOW TIRES

1. Use tire chains only on the front wheels. Do not use tire chains on rear wheels.
2. When using snow tires, use them on all four wheels for maneuverability and safety.

Suspension System > Tires/Wheels > Wheel > Repair procedures

FRONT WHEEL ALIGNMENT

TOE-IN

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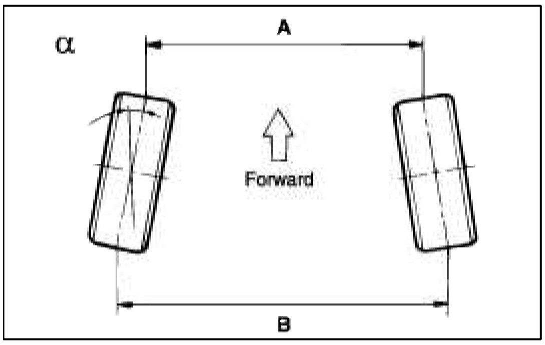
Standard value
Toe-in (B-A): 0±3 mm (0±0.12 in.)

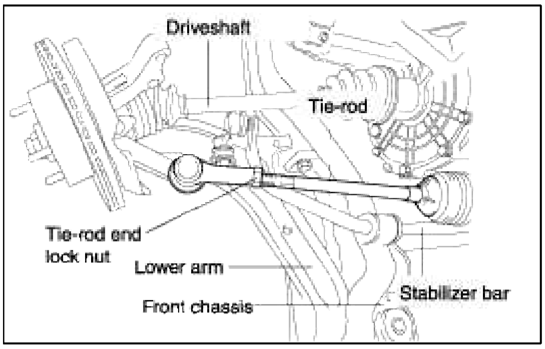
Description		Toe changes mm (in.)/deg.
No. of turns of tie rod (Same amount for right and left)	1/2	Approx. 5.5(0.217)/32.5′
	1	Approx. 11(0.433)/1°


α
A
Forward
B

NOTE

- Toe-in adjustment should be made by turning the right and left tie rods by the same amount.
- When adjusting toe-in, loosen the outer bellows clip to prevent twisting the bellows.
- After the adjustment, tighten the tie rod end lock nuts firmly and reinstall the bellows clip.

Tightening torque
Tie rod end lock nuts:
50~55 Nm (500~550 kgf·cm, 36~40 lbf·ft)

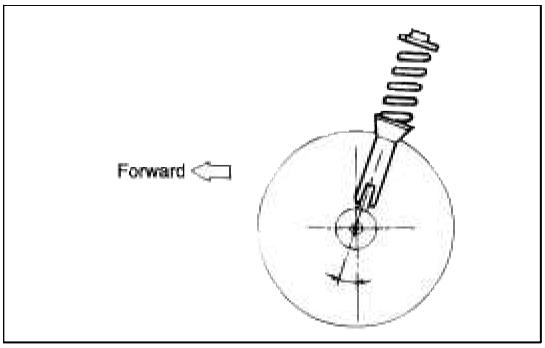

Driveshaft
Tie-rod
Tie-rod end lock nut
Lower arm
Front chassis
Stabilizer bar

CAMBER

Standard value
Front camber: 0° ± 30′

CASTER

Standard value
Front caster: 1°48′ ± 30′



REAR WHEEL ALIGNMENT

TOE-IN

Standard value

Rear toe-in: 3 ± 2mm (0.12 ± 0.079 in.)

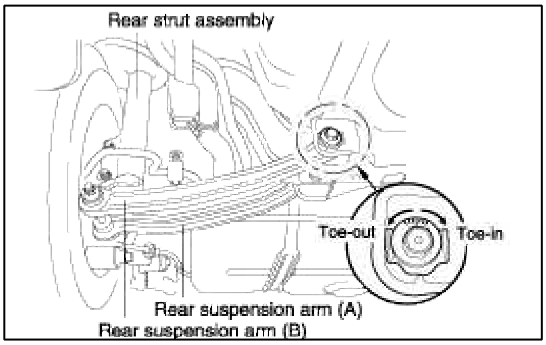
NOTE

- Release parking brake for the better measurement.
- The rear suspension arm (B) mounting bolt should be turned an equal amount on both sides when adjusting.

Inside of the vehicle: toe-in
Outside of the vehicle: toe-out
The scale has graduations of approximately 2.4 mm (0.09 in.)
(single side toe angle quivalent to 14′)

CAUTION

The eccentric bolt should be adjusted within a 90° range left and rightfrom the center position.


Rear strut assembly
Toe-out
Toe-in
Rear suspension arm (A)
Rear suspension arm (B)

CAMBER

Standard value

Rear camber: -41′ ± 30′

Rear camber is also pre-set at factory and can not be adjusted.
If the camber measured is not within the standard value below, replace the bent or dmaged parts.

WHEEL RUNOUT

1. Jack up a vehicle and support it with a jack stand.

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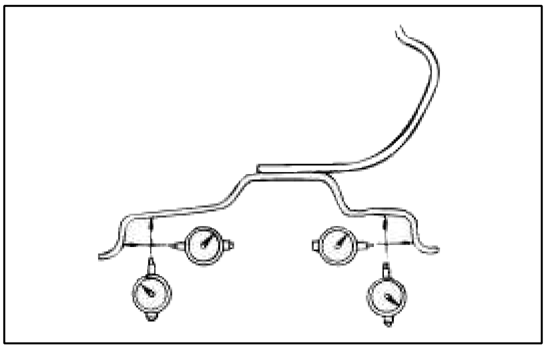
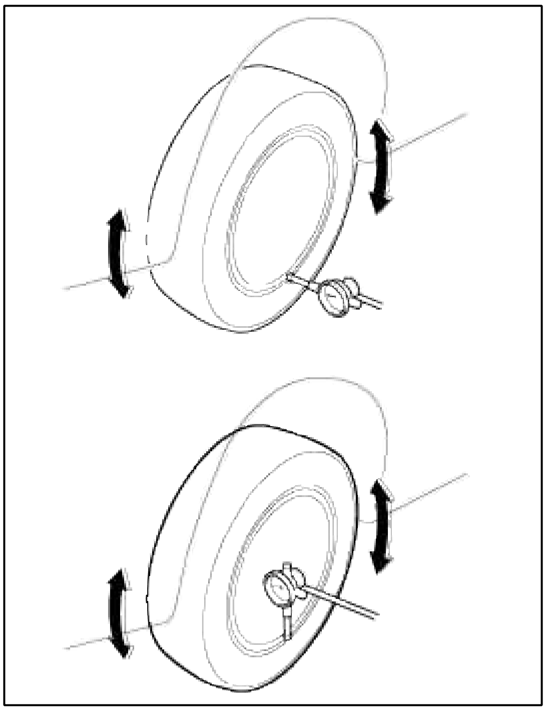
2. Measure the wheel runout with a dial indicator as illustrated.





3. Replace the wheel if the wheel runout exceeds the limit. (refer to 'SERVICE STANDARD'. see page SS-p.3)

Wheel runout [Limit]
Steel wheel
- Radial : 0.6mm (0.028 in.) : Average of LH & RH)
- Axial : 0.8mm (0.032 in.)
Aluminum wheel
- Radial : 0.3mm (0.012 in.)
- Axial : 0.3mm (0.012 in.)

WHEEL NUT TIGHTENING

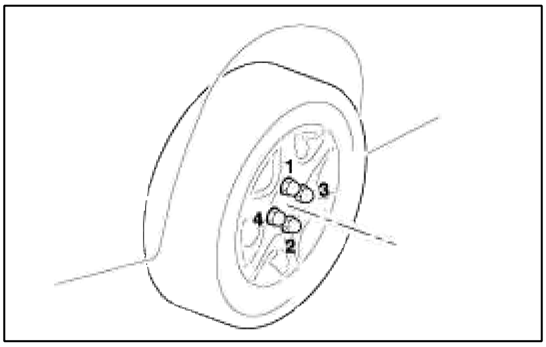
1. Tightening torque.
   Steel and aluminum alloy wheel.

Specified torque
90~110 Nm (900~1,100 kgf·cm, 65~80 lbf·ft)

CAUTION

When using an impact gun, final tightening torque should be checked using a torque wrench.

2. Tightening order.
   Go around the wheel tightening every other nut until they are all tight.
   Then double-check each nut for tightness.



INSTRUCTIONS FOR ALUMINUM TYPE WHEELS

1. Aluminum is vulnerable to alkalies. If the vehicle has been exposed to automobilewashing detergent, or salt from sea water, or road chemicals, rinse the vehicleas soon as possible. Then apply wax to the wheels to prevent corrosion.
2. When steam cleaning the vehicle, do not direct the steam onto the aluminumwheels.
   When tightening nuts for aluminum wheels, observe the following :
   (1) Clean the hub surface.
   (2) After finger-tightening the wheel nuts, tighten to specifications.
   (3) Do not use an impact gun or push the wrench by foot to tighten the wheel nuts.
   (4) Do not apply oil to the threaded portions.

Suspension System > Tires/Wheels > Repair procedures

WHEEL & TIRE BALANCE

1. Dynamic imbalance of wheel & tire assy should not exceed AL wheel : 40g, STEEL wheel : 60g per bead seat before balancing.
2. After balancing dynamic imbalance, balance weight should not exceed AL wheel : 80g, STEEL wheel : 100g per wheel & tire assy except andit M/C addition work.
3. Balance weight must not over 1 for each side of except additional balancing with andit M/C.
4. In case balance weight positions concord each other, attach them side by side.
   In case imbalance at andit M/C, balance following table.

Unbalance per bead seat	Balance weight
0 ~ 7.5g	No balancing work
7.6 ~ 12.5g	10g
12.6 ~ 17.5g	15g
17.6 ~ 27.5g	20g
27.6g ~	Discompose wheel and tire

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